

# *SOUTHEASTERN BIOLOGY*

(Formerly *The ASB BULLETIN*)

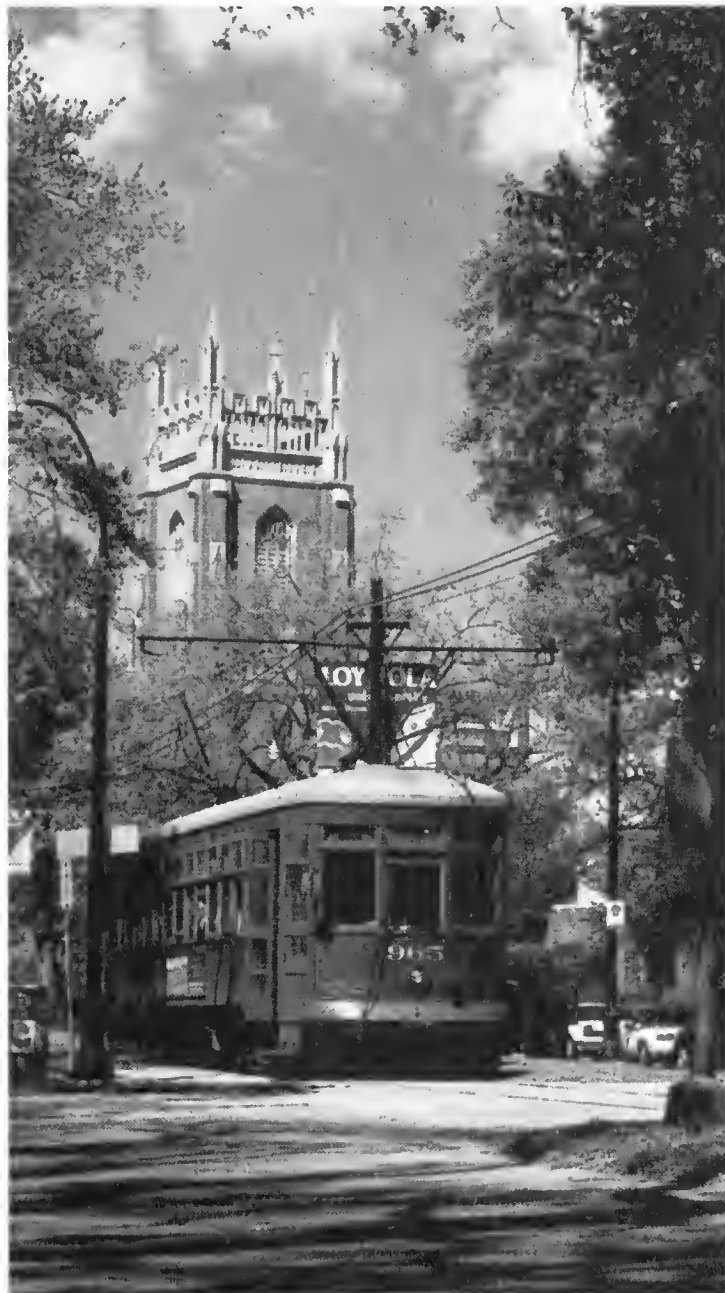


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New Orleans streetcar on the St. Charles line represents an important means of mass transit for citizens of the city, as well as a major tourist attraction.

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## **SOUTHEASTERN BIOLOGY**

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Print Editor ..... James D. Caponetti, Dept. of Botany, University of Tennessee, Knoxville, TN 37996-1100; (865) 974-2256; FAX (865) 974-2258; [jcaponet@utk.edu](mailto:jcaponet@utk.edu).  
Associate Editor ..... Terry Richardson, Dept. of Biology, UNA Box 5212, University of North Alabama, Florence, AL 35632-0001; (205) 765-4429; [trichard@unanov.una.edu](mailto:trichard@unanov.una.edu).  
Web Editor ..... Howard Neufeld, Dept. of Biology, P. O. Box 32027, Appalachian State University, Boone, NC 28608-2027; (828) 262-2683; FAX (828) 262-2127; [neufeldhs@appstate.edu](mailto:neufeldhs@appstate.edu).  
Business Manager..... Tim Atkinson, Carolina Biological Supply Co., 2700 York Road, Burlington, NC 27215; (336) 538-6224; [tatkinson@carolina.com](mailto:tatkinson@carolina.com).  
News Editor..... Jon Fortman, Div. of Sci. and Math, Mississippi University for Women, Columbus, MS 39701; (601) 329-7379; FAX (601) 329-7238; [jfortman@sunmuw1.muw.edu](mailto:jfortman@sunmuw1.muw.edu).  
Book Review Editor .... James Ross, 7196 College Station Dr., Cumberland College, Williamsburg, KY 40769-1382; (606) 549-2200 x4381; [jross@cc.cumber.edu](mailto:jross@cc.cumber.edu).

### **ASB OFFICERS**

President..... Howard Neufeld, Dept. of Biology, P. O. Box 32027, Appalachian State University, Boone, NC 28608-2027; (828) 262-2683; FAX (828) 262-2127; [neufeldhs@appstate.edu](mailto:neufeldhs@appstate.edu).  
President-elect ... Robert Haynes, Dept. of Biological Sciences, University of Alabama, Tuscaloosa, AL 35487; (205) 348-1826; [rhaynes@biology.as.ua.edu](mailto:rhaynes@biology.as.ua.edu).  
Vice-President.... Andrew Ash, Dept. of Biology, University of North Carolina, Pembroke, NC 28372-1510; (910) 521-6418; [aash@nat.uncp.edu](mailto:aash@nat.uncp.edu).  
Past President.... Patricia Parr, P. O. Box 2008, Oak Ridge National Laboratory, Oak Ridge, TN 37830-6038; (865) 576-8123; FAX (865) 576-8646; [par@ornl.gov](mailto:par@ornl.gov).  
Secretary..... Terry Richardson, Dept. of Biology, UNA Box 5212, University of North Alabama, Florence, AL 35632-0001; (205) 765-4429; [trichard@unanov.una.edu](mailto:trichard@unanov.una.edu).  
Treasurer..... Tim Atkinson, Carolina Biological Supply Co., 2700 York Road, Burlington, NC 27215; (336) 538-6224; [tatkinson@carolina.com](mailto:tatkinson@carolina.com).  
Archivist ..... John Herr, Dept. of Biological Sciences, University of South Carolina, Columbia, SC 29208; (803) 777-8110; FAX (803) 777-4002; [herr@mail.biol.sc.edu](mailto:herr@mail.biol.sc.edu).  
Executive Committee Members-at-Large  
2001: George Cline, Department of Biology, Jacksonville State University, Jacksonville, AL 36265; (256) 782-5798; [gcline@jsucc.jsu.edu](mailto:gcline@jsucc.jsu.edu).  
Joe Pollard, Department of Biology, Furman University, Greenville, SC 29613-0418; (846) 294-3249; [joe.pollard@furman.edu](mailto:joe.pollard@furman.edu).  
2002: Gerhard Kalmus, Department of Biology, East Carolina University, Greenville, NC 27858-4353; (252) 328-6306; [kalmusg@mail.ecu.edu](mailto:kalmusg@mail.ecu.edu).  
Bonnie Kelley, Department of Biology, University of North Carolina, Pembroke, NC 28372-1510; (910) 521-6419; [kelley@nat.uncp.edu](mailto:kelley@nat.uncp.edu).  
2003: Henry Bart, Tulane Museum of Natural History, Belle Chasse, LA 70037; (504) 394-1771, FAX (504) 394-5045; [hank@museum.tulane.edu](mailto:hank@museum.tulane.edu).  
Kim Marie Tolson, Department of Biology, University of Louisiana at Monroe, Monroe, LA 71209-0520; (318) 342-1805; FAX (318) 342-3312; [bitolson@ulm.edu](mailto:bitolson@ulm.edu).

### **PURPOSE**

The purpose of this association shall be to promote the advancement of biology as a science by encouraging research, the imparting of knowledge, the application of knowledge to the solution of biological problems, and the preservation of biological resources. The ASB has representation in Section G Committee of the AAAS. Varying types of membership are available to individuals and institutions. Members receive *Southeastern Biology*.

### **TIME AND PLACE OF FUTURE MEETINGS**

2001 April 4-7 Tulane and Loyola Universities, New Orleans, LA; see: <http://www.loyno.edu/~asb/>  
2002 April 10-13 Appalachian State University, Boone, NC; see: <http://www.asb.appstate.edu/asb2002.htm>

**PROGRAM of the  
62<sup>nd</sup> ANNUAL MEETING of the  
ASSOCIATION OF SOUTHEASTERN BIOLOGISTS**

Hosted by

**TULANE UNIVERSITY  
and  
LOYOLA UNIVERSITY**

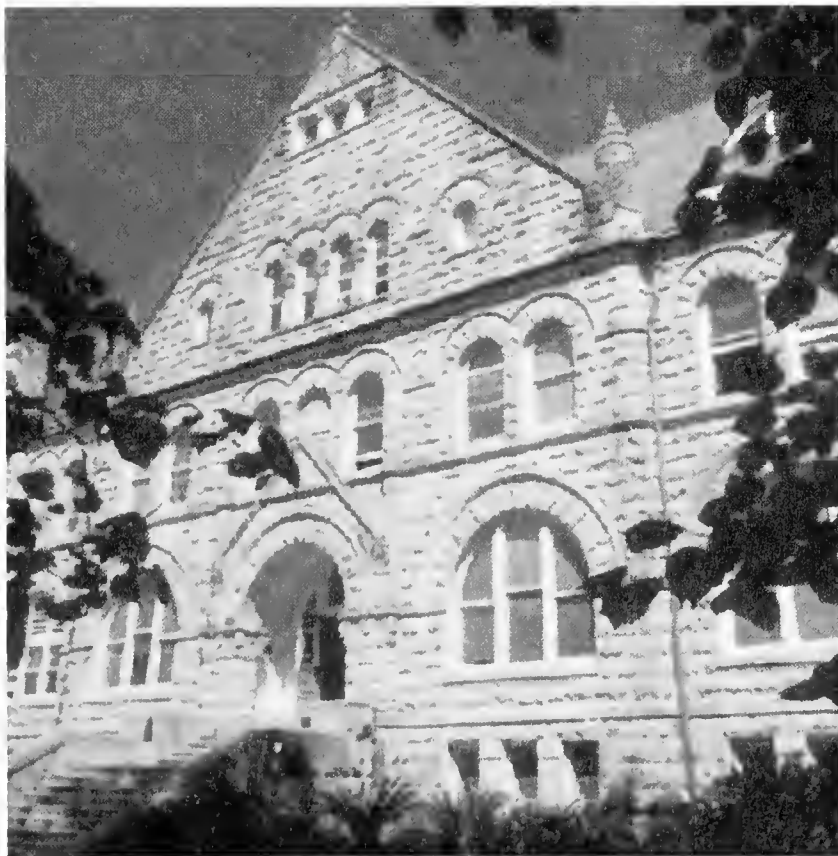
meeting location

**Radisson Hotel, New Orleans  
1500 Canal Street**

**SOCIETIES MEETING WITH ASB IN NEW ORLEANS**

American Society of Ichthyologists and Herpetologists,  
Southeastern Division (ASIH)  
Beta Beta Beta (BBB)

Botanical Society of America, Southeastern Division (BSA)  
Ecological Society of America, Southeastern Division (ESA)  
Society of Wetland Scientists, South Atlantic Chapter (SWS)  
Southeastern Fishes Council (SFC)  
Southern Appalachian Botanical Society (SABS)



Tulane University, Gibson Hall

### ASB CANDIDATES FOR OFFICE-2001

The Nominating Committee composed of Eloise Carter (Chair), John Aho, and Beverly Collins has selected the following slate of nominees for the ASB offices to be filled in 2001. **Voting will take place at the annual business meeting at noon on Friday, April 6, 2001.** Additional nominations will be accepted from the floor before voting is conducted. Please plan to attend. The recent, close election for President of the U.S.A. has demonstrated that your vote could make a difference on who gets elected to office.

<i>President Elect</i>	<b>J. Kenneth Shull</b>	Appalachian State University Boone, North Carolina
	<b>Andrew N. Ash</b>	University of North Carolina Pembroke, North Carolina
<i>Vice President</i>	<b>Philip A. Robertson</b>	Southern Illinois University Carbondale, Illinois
	<b>Doug Rayner</b>	Wofford College Spartanburg, South Carolina
<i>Executive Committee</i>	<b>Scott B. Franklin</b>	University of Memphis Memphis, Tennessee
	<b>W. Michael Dennis</b>	Breedlove, Dennis, & Assoc., Inc. Orlando, Florida and Nashville, Tennessee
	<b>Rebecca Cook</b>	Lambuth University Jackson, Tennessee
	<b>John M. Aho</b>	Auburn University Montgomery, Alabama



J. Kenneth Shull



Andrew N. Ash



Doug Rayner



W. Michael Dennis



Rebecca Cook

## PRESIDENT-ELECT

**J. Kenneth Shull** – Dr. J. Kenneth Shull, Jr., is a Professor of Biology at Appalachian State University in Boone, North Carolina where he joined the faculty in 1984. He was formerly an Associate Professor and Chairperson of the Department of Biological Sciences at Loyola University in New Orleans, La. Ken received his B.S. in chemistry (1963) and M.S. in biology (1967) from the University of Alabama, and his Ph.D. in genetics (1973) from Florida State University. His research interests include chromosome evolution, especially in *Lilium*, meiotic nuclear fine structure, and the genetics of female mate preference in *Drosophila melanogaster*. Besides general biology, genetics and cytogenetics, his teaching interests have included bioethics, a course that he has developed at two institutions. He has tried to make the public aware of developments and issues in biology by speaking to high school classes, church and civic groups on a variety of topics. He received the 2000 Outstanding Adviser Award at Appalachian State. In 1986, 1989, 1992 and 1995, he organized the Boone Chromosome Conference, an international meeting that dealt with current research in cytogenetics, especially the events of meiosis. He has been a member of ASB since 1971, serving on several committees and chairing numerous sessions at annual meetings. He has organized or helped to organize three symposia at ASB meetings including one on ecological genetics, one with Dr. M. J. Sedivec, on the ramifications of the use of animals in teaching and research, and one with Margaret Menzel, on cytogenetics. He served as editor of the *ASB Bulletin* from 1995 to 2000. As editor, he converted the fourth issue to a research/debate issue. He currently serves as chair of the ASB publications committee. Ken was chair of the Local Arrangements Committee for the 1991 ASB meeting at Appalachian State and is currently serving as chairperson of the program committee for the 2002 ASB meeting at Appalachian State University. In 1982-83, he served as Vice President of ASB.

**Andrew N. Ash** – Dr. Ash is Professor of Biology at UNC Pembroke, Pembroke, NC. He received an undergraduate degree in biology from the Virginia Military Institute, a M.S. in plant ecology from North Carolina State University, and a Ph.D. in wildlife biology from the University of Toronto. His research concerns the effects of forest management on Southern Appalachian salamanders. He is a member of the Ecological Society of America, the Association of Southeastern Biologists, the Southern Appalachian Botanical Society and other organizations. Dr. Ash has served ASB and its affiliates in the following capacities: Secretary/treasurer, Southeastern Section of ESA, chair of the Odum Award Committee, ESA; chair of the Elizabeth Ann Bartholomew Award Committee, SABS; Membership Committee, SABS; Education Committee, ASB; Executive Committee, ASB; Patron Member and Exhibitor Committee, ASB. He has served as Secretary of ASB and currently serves as Vice-president of ASB. At present, Dr. Ash serves on the following committees external to ASB: N.C. State Parks Natural Heritage Advisory Committee, Lumber River State Park Citizens' Advisory Committee, Highlands Biological Station Board of Scientific Advisors, Highlands Biological Station Board of Directors, Highlands Biological Foundation Board of Trustees. He is President of the Highlands Biological Foundation.

## VICE PRESIDENT

**Philip A. Robertson** – Dr. Robertson is Professor of Plant Biology at Southern Illinois University Carbondale. He received his B.S. in Forestry and Range Management (1962), his M.S. in Range Science (1964) and his Ph.D. in Plant Ecology (1968) from Colorado State University. He taught at the State University College of New York at Oneonta before becoming a faculty member at SIUC. His research interests lie in the area of soil/site relationships of forest species and communities in both upland and lowlands of the Central Hardwoods region. In addition, he has conducted research on the effects of fire in upland oak-hickory communities, dendrochronology of lowland forest tree species and characteristics of old-growth forests both in the Midwest and Rocky Mountains. Recently, he has been involved in studies of disturbance in old-growth forests of southern Illinois. He has been an active member of ASB since 1971 and served on the Executive Committee from 1995-1998. He is also a member of Ecological Society of America, Sigma Xi, The International Association for Vegetation Science, Torrey Botanical Society and Illinois Academy of Science. Currently, he is Director of the Biological Sciences program and Graduate Advisor and Assistant Chair in the Department of Plant Biology at SIUC.

### **Doug Rayner – Rayner Becomes SC Nature Conservancy Trustee**

The Nature Conservancy of South Carolina has named Dr. Doug Rayner to its board of trustees. Rayner is associate professor of biology at Wofford College, Spartanburg.

A native of Berlin, New Hampshire, Rayner completed his Ph.D. in biology at the University of South Carolina. Prior to joining the Wofford faculty 11 years ago, he worked as a field research botanist for the Heritage Trust Program, South Carolina Wildlife and Marine Resources Department.

Part of the largest private system of nature sanctuaries in the world, the Nature Conservancy of South Carolina has protected more than 165,000 acres in the state during a 21-year history.

Rayner has worked with the organization in several capacities and was the first recipient of its LaBruce Award, which honors an individual who had made significant contributions to natural resource conservation in South Carolina.

Rayner is also active in the South Carolina Academy of Science, the Association of Southeastern Biologists, and the Southern Appalachian Botanical Club in addition to local civic and scientific associations.

## EXECUTIVE COMMITTEE

**Scott B. Franklin** – Dr. Franklin joined the Biology faculty at the University of Memphis in August 1997 as an Assistant Professor. He received his B.S. in Biology/Conservation Management from Upper Iowa University (1988), his M.S. in Forest Ecology from Southern Illinois University (1990), and his PhD in Plant Ecology from Southern Illinois University (1996). During the 1995-1996 academic year, he visited the University of Joensuu, Finland, as a Fulbright Scholar. His research interests examine disturbance and vegetation dynamics. He is



specifically interested in the short- and long-term response of vegetation communities to natural and applied (management) disturbance. His studies include effects of prescribed burning on upland oak forest vegetation, soil nutrients, and soil microorganisms, and the effects of channelization on the western Tennessee floodplain forest function (especially nutrient cycling). He is also interested in the spatial aspects of the landscape and their influence on community structure and function, which he is studying in Belize, C.A., examining the effects of a decreasing forest matrix on the sustainability of slash-and-burn agriculture. His research has been funded by the State of Tennessee, Army Corps of Engineers, and United States Forest Service. He has served as major advisor of three Masters theses and currently directs two graduate students. He has been an active member of ASB and the Southeastern Chapter of the Ecological Society of America (SE-ESA) since 1989. He will be ending his terms on the ASB Student Awards Committee and as the Vice-chair of SE-ESA in April 2001. He is also a member of the Southern Appalachian Botanical Society, International Association of Vegetation Scientists, and Sigma Xi.

**W. Michael Dennis** – Dr. Dennis is President and Senior Scientist of Breedlove, Dennis & Associates, Inc., which has offices in Orlando, Florida and Nashville, Tennessee. He is also a visiting professor at the University of Tennessee, where he has taught courses on Aquatic and Wetland Plants of the Tennessee Valley for 20 years. Dr. Dennis received a B.S. in Biology from Emory University, a M.S. in Biology from the University of South Carolina and a Ph.D. from the University of Tennessee. For 5 years he studied and published research on aquatic plants of the Tennessee Valley working with the Tennessee Valley Authority. He is a practicing wetland ecologist and consults and provides expert witness testimony in the areas of wetlands, wetland mitigation, threatened and endangered species, vegetation and wildlife. Dr. Dennis has been a member of ASB for almost 30 years and has served as Chair of the ASB Enrichment Fund and a member of the Patron Committee. BDA has also been a longstanding Patron Member of ASB.

**Rebecca Cook** – Dr. Cook is an Assistant Professor of Biology at Lambuth University in Jackson, TN. She obtained her B.S. in Biology from Hendrix College, her M.S. in Environmental Science from Rice University, and her Ph.D. in Botany from the University of Tennessee. In her current position, she teaches introductory biology for both majors and non-majors as well as courses in botany, microbiology, and environmental science. She held faculty positions at the University of Tennessee, Georgetown College, and Monmouth College before joining the faculty at Lambuth in 1997. Her research interests are in the population biology of herbaceous plants with particular interest in rare and endangered species. She is currently involved in a demographic study of *Delphinium exaltatum* at Oak Ridge National Laboratory. She has been a member of ASB since 1991 and is currently serving on the Meritorious Teaching Award Committee. She also belongs to the Southern Appalachian Botanical Society, the Southeastern Section of the Botanical Society of America, the Tennessee Academy of Science, and other organizations.



**John M. Aho** – Aho, John M., b. Milwaukee, WI, 1953; *EDUCATION*: B.A. (Biology) Wake Forest University, 1975; M.A. (Biology) Wake Forest University, 1979; Ph.D. (Ecology) University of Exeter, UK, 1981. Post-Doctoral Fellow: University of Alberta, Dept. of Zoology, 1981-1983; Savannah River Ecology Laboratory, University of Georgia 1983-84; *PROFESSIONAL EXPERIENCE*: Assistant Research Ecologist, Savannah River Ecology Laboratory, University of Georgia 1984-90; Visiting Assistant Professor, Wake Forest University 1990-92; Assistant Professor, Auburn University at Montgomery 1992-1997; Associate Professor, 1997-present. *REVIEWER*: J. Parasitol., Am. Midl. Nat., Comparative Parasitology. (Editorial Board, 1997-2000), Can. J. Zool., Copeia (Editorial Board, Physiological Ecology, 1994-95), Ecology, Parasitology, NSF, DOE. *MEMBER*: American Society of Parasitologists; Association of Southeastern Biologists (E.P. Odum Student Award Committee, 1996-99; Poster Award Committee, 1999-present; Nominations Committee, 2000-01); Southeastern Society of Parasitologists (President, 1998; President-Elect, 1997; Vice-President, 1994-95; Representative to ASB Executive Council, 1993-present); Helminthological Society of Washington; Ecological Society of America; North American Benthological Society; American Society of Ichthyologists and Herpetologists; American Institute of Biological Sciences; Sigma Xi. *AWARDS*: Fulbright-Hayes Scholarship, 1977-79; Fuller Research Scholarship in Biological Science (Univ. of Exeter, UK, 1979-80); Killam Postdoctoral Fellowship (1981-83). Research Interests: Population and community ecology of invertebrates and fishes, stream ecology, population and community ecology of parasites, effects of parasites on host population dynamics.



Jackson Square, New Orleans

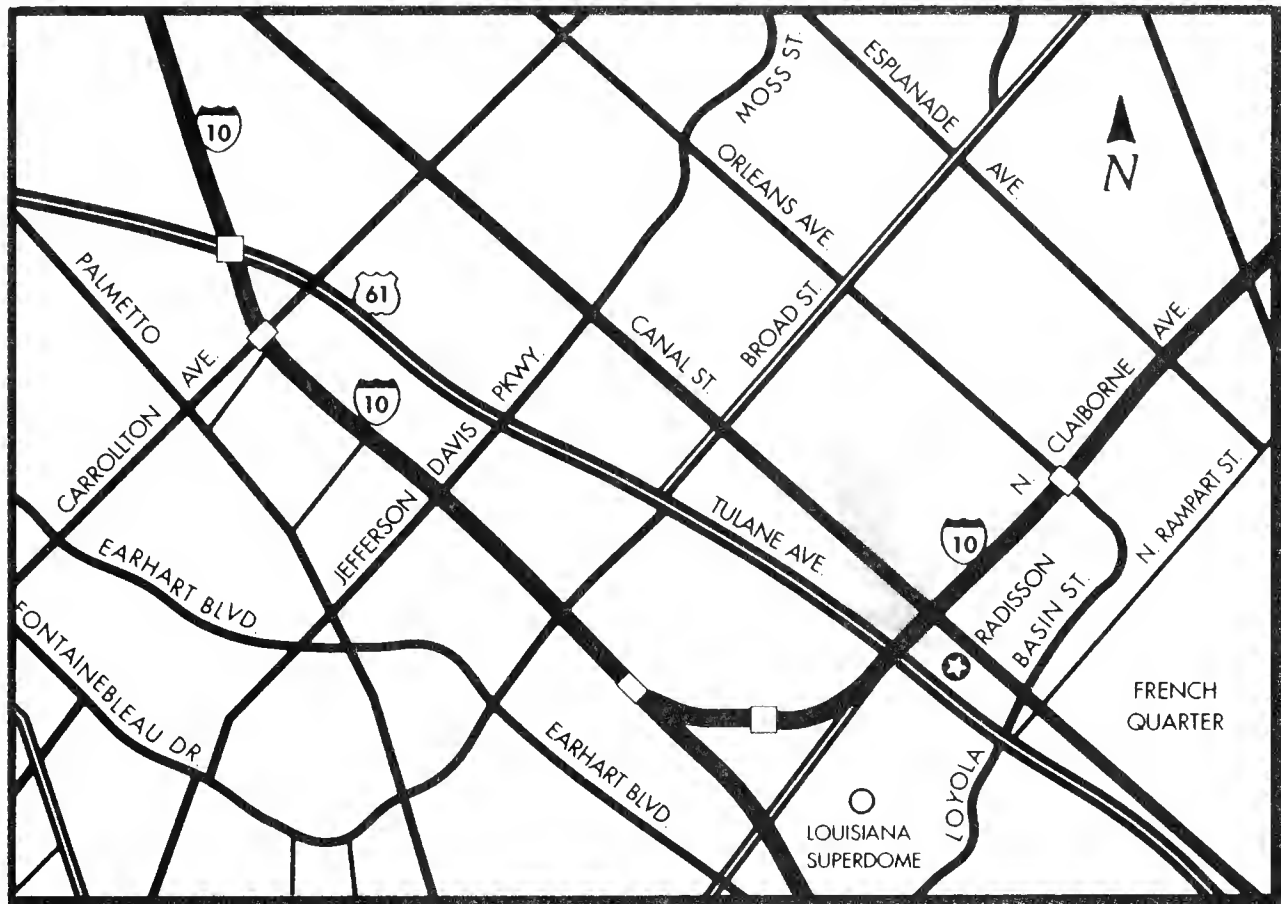
## GENERAL INFORMATION

**Registration:** Registration information and pre-registration forms were published in the December 2000 issue of the *ASB Bulletin* and the January 2001 issue of *Southeastern Biology*. Pre-registrants may pick up their registration packet at the meeting registration desk located just outside of the Exhibit Hall in the Radisson Hotel starting Wednesday, April 4<sup>th</sup> at 3:00 PM. The registration desk will be open Thursday April 5th, from 8:00 AM to 5:00 PM, and Friday April 6th, from 8:00 AM to noon for late arrivals and late registrants. **Please bring this issue of *Southeastern Biology* with you to the meeting.** It contains details on the program, and abstracts of presentations. Additional copies will be available at the meeting registration desk for a fee of \$5.00. Updated versions of the program (without abstracts) will be posted at the meeting web site (<http://www.loyno.edu/~asb/>). Please check the web site for the latest meeting updates. The final program will be included in your registration package.

**Ground Travel:** A map of Downtown New Orleans, showing the location of the Radisson Hotel, is printed in this issue. The Radisson Hotel is conveniently located near the Canal Street/Superdome Exit from westbound I-10, or via the Claiborne Ave. /Superdome Exit from eastbound I-10. Days Inn (1630 Canal Street) is located at the corner of Canal and Claiborne Ave. For additional information on travel to and within New Orleans, please consult the following on-line travel guides: <http://www.zip2.com/>, <http://home.digitalcity.com/maps/>, or <http://www.mapquest.com/>.

- ◆ If entering New Orleans on westbound I-10, take the Canal Street/Superdome Exit. At the base of the exit ramp, proceed straight through the intersection (Cleveland Ave.) one block to Canal Street, and turn right. Proceed under the Interstate (Claiborne Ave. intersection), three blocks to the corner of LaSalle and Canal Street. The Radisson will be on your right. Days Inn is also on the right at the corner of Canal and Claiborne Ave.
- ◆ If entering New Orleans on eastbound I-10, follow the signs to New Orleans Business District. Remain on the right side of the Interstate. You will pass Xavier University and signs exits diverting traffic I-10 East toward Slidell. Proceed straight to the Claiborne Ave/ Superdome Exit Only lane, and follow this to the Claiborne Ave. down ramp. Once on Claiborne Ave., proceed straight ahead 5 blocks (3 traffic lights) to Canal Street, and turn right. The Radisson Hotel will be three blocks ahead on your right, at the corner of LaSalle and Canal Street. Days Inn is also on the right at the corner of Canal and Claiborne Ave.

**Air Travel:** Meeting attendees who fly into the New Orleans International Airport can use the Airport Shuttle for transportation to the Radisson Hotel (cost \$10 one way) or taxi service. The flat rate for airport cabs is \$24 for one or two people, and \$10 each for additional passenger.



New Orleans Street Map



Radisson Hotel On Canal Street

**Parking and Local Transportation:** The Radisson Hotel provides valet parking for \$17.92 per day for overnight guests, and \$10.00 per day for attendees staying at other hotels. There are several parking lots and garages within easy walking distance of the Radisson. Parking rates vary from \$3.00 to \$7.00 per day. For details on locations and rates for these parking lots, please visit the ASB New Orleans web site (<http://www.loyno.edu/~asb/>).

New Orleans has a great system of public transportation. Several bus lines run along Canal Street just outside of the hotel, and passengers may transfer from these buses to the St. Charles and Riverfront streetcar lines. The fare is \$1.25 (\$1.50 with transfer). Exact change is required. The Radisson Hotel provides complimentary shuttle service from the Hotel to the Riverwalk, Harrah's Casino, and Jax Brewery in the French Quarter. The shuttle runs from 10:00 AM until 12 midnight. Complimentary charter buses will provide transportation to and from the evening social.

**Job Placement and Message Boards:** A pin-up board will be available near the registration desk for position announcements and messages.

**Local Dining:** Your registration package contains a list of recommended restaurants in the Downtown area with discount coupons for meals and entertainment.

**Social Activities and Events:** Passes for social events will be included in the registration packets for those who have paid for the events in advance. Times and places for these activities are provided in the program schedule below and in the schedule posted at the meeting web site (<http://www.loyno.edu/~asb/>). A limited number of tickets may be available at the registration desk for those who did not pre-pay.

**Wednesday Evening Plenary Session and Welcoming Social:** The Plenary session will feature an address by noted biologist Dr. Peter Raven of the Missouri Botanical Garden (*Tulane Room*), which will be followed immediately by a welcoming social (*Exhibit Hall*), featuring music by a New Orleans Brass Band. Please check the schedule below for times. A cash bar will be available and light snacks will be served. Exhibitors will be set up in the Exhibit Hall for your convenience.

**Thursday Evening "Stomp in the Swamp":** The Thursday evening social will be held in the Louisiana Swamp Exhibit at the Audubon Zoo from 7:00-10:00 PM. Stroll around the exhibit viewing animals of the swamp and learning about Cajun culture, while dining on Chicken and Andouille Sausage Jambalaya, New Orleans Red Beans and Rice (with grilled sausage or vegetarian style), Pasta Primavera with Garden Fresh Seasonal Vegetables in a creamy Alfredo Sauce, Garlic Bread, Bread Pudding with Whiskey Sauce, wine, beer and soda. Then ease into the pavilion for some jumping Zydeco music by Sunpie Barnes and the Louisiana Sun Spots. Transportation will be provided to and from the event, with buses departing the Radisson Hotel starting at 6:30 PM, and returning to the Radisson starting at 9:00 PM.

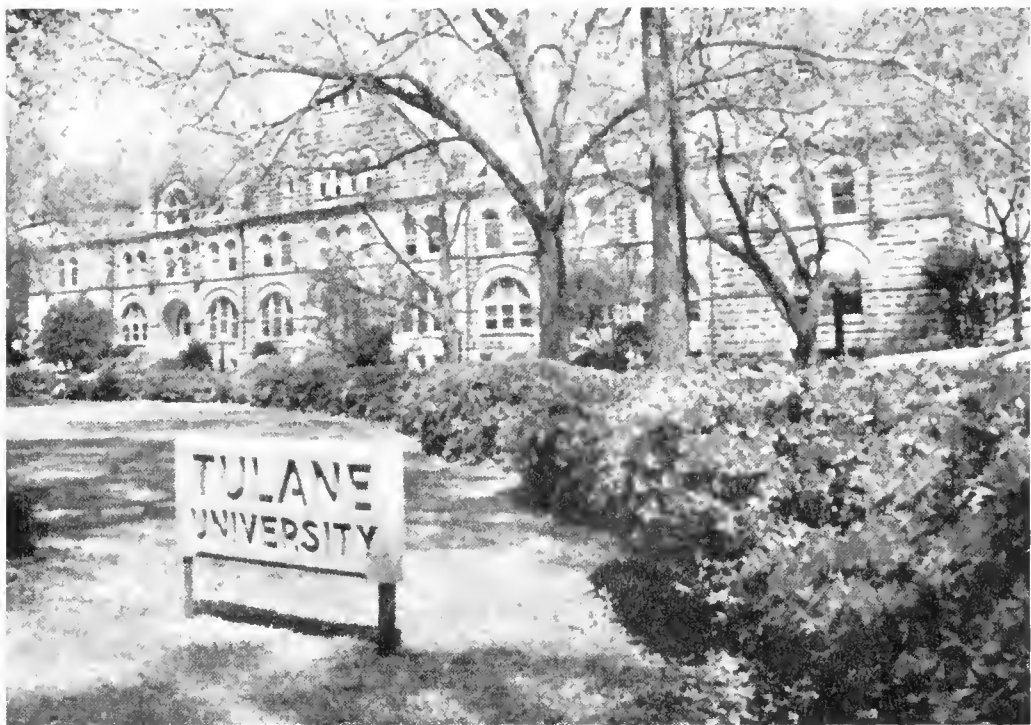
**Friday Evening Banquet:** The ASB Banquet will be preceded by a cash bar social hour from 6:00-7:00 PM in the foyer outside the Tulane Room at the Radisson Hotel. The ASB Banquet will be held from 7:00-9:00 PM in the Tulane Room. An awards presentation will follow the banquet. The evening will conclude with the traditional ASB Past President's Address.

**Field Trips:** The New Orleans ASB Local Committee has gone to unusual effort to offer 12 spectacular field trips to diverse regional ecosystems. The local committee recognizes that our city attractions are hard to beat. So, we hope our trips will lure you from the city for at least part of your stay. We are offering trips with accommodating departure and return times. The trips are scheduled on Wednesday afternoon before the meeting begins and on Saturday with early return times. You can still enjoy New Orleans on Saturday night and all day Sunday! All field trips depart from in front of the Radisson Hotel. Field trips are detailed in the January 2001 issue of *Southeastern Biology* and on the meeting website (<http://www.loyno.edu/~asb/>).

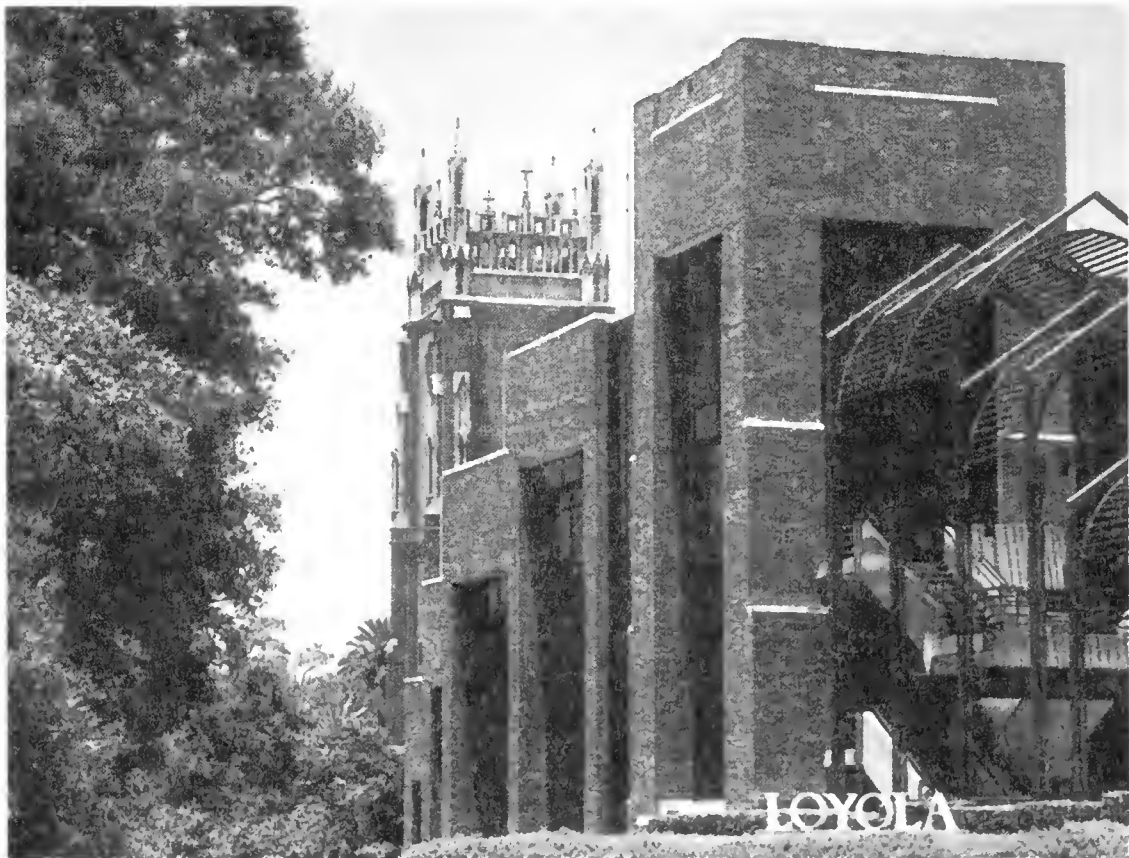
**Information Sources:** For more detailed information about the meeting and host institutions, please refer to the January 2001 issue of *Southeastern Biology* and/or visit the meeting web site <http://www.loyno.edu/~asb/>). For comprehensive information on the City of New Orleans (attractions, accommodations, dining, shopping, etc.), please visit our visitors guide (<http://www.tulane.edu/~bfleury/neworleans/NewOrleans.htm>) or the New Orleans Metropolitan Convention and Visitor's Bureau web site (<http://neworleanscvb.com/>).

**LOCAL ARRANGEMENTS COMMITTEE**

Local Arrangements Co-Chair, Symposia/ workshops	<b>Hank Bart</b> , <a href="mailto:hank@museum.tulane.edu">hank@museum.tulane.edu</a>
Local Arrangements Co-Chair, Program Co-chair, Web Master	<b>Craig Hood</b> , <a href="mailto:chood@loyno.edu">chood@loyno.edu</a>
Program Co-Chair	<b>David Heins</b> <a href="mailto:Heins@mailhost.tcs.tulane.edu">Heins@mailhost.tcs.tulane.edu</a>
Beta Beta Beta	<b>Patricia Dorn</b> , <a href="mailto:dorn@loyno.edu">dorn@loyno.edu</a>
Commercial Exhibits	<b>Don Hauber</b> , <a href="mailto:hauber@loyno.edu">hauber@loyno.edu</a>
Field Trips	<b>Dave White</b> , <a href="mailto:dawhite@loyno.edu">dawhite@loyno.edu</a>
Posters and Audiovisual	<b>Beth Wee</b> , <a href="mailto:bwee@tcs.tulane.edu">bwee@tcs.tulane.edu</a>
Registration and Meeting Statistics	<b>Melinda Epperson</b> <a href="mailto:epperson@tmcpop.tmc.tulane.edu">epperson@tmcpop.tmc.tulane.edu</a>
Social Events	<b>Frank Jordan</b> , <a href="mailto:jordan@loyno.edu">jordan@loyno.edu</a>
Transportation, parking and tourism	<b>Bruce Fleury</b> , <a href="mailto:bfleury@tcs.tulane.edu">bfleury@tcs.tulane.edu</a>



Tulane University



Loyola University



**PLENARY SPEAKER – PETER H. RAVEN***Global Biodiversity: Current Strategies for Saving it*

**Peter H. Raven**, one of the world's leading botanists, has dedicated nearly three decades to conservation and biodiversity as Director of the Missouri Botanical Garden, where he has cultivated a world-class institution of horticultural display, education, and research. Described by *Time* magazine as a "Hero for the Planet," Dr. Raven champions research around the world to preserve endangered plants and is a leading advocate for conservation and a sustainable environment.

Dr. Raven has served as Director of the Missouri Botanical Garden and Engelmann Professor of Botany at Washington University since 1971. Under Dr. Raven's leadership, the Missouri Botanical Garden has become a leader in botanical research in Latin America, Africa, and Asia, with strong programs in North America as well. The Garden's education program in the St. Louis region reaches more than 100,000 students each year and provides professional development for teachers. The splendid horticultural displays attract more than 750,000 visitors to the Garden annually, including tourists to St. Louis from around the United States and the world.

Dr. Raven is a member of President Clinton's Committee of Advisors on Science and Technology and is the Chairman of the National Geographic Society's Committee for Research and Exploration. He is President-Elect of the American Association for the Advancement of Science, the world's largest organization of professional scientists, and will assume office as President in 2001. He served for 12 years as Home Secretary of the National Academy of Sciences, is a member of the academies of science in Argentina, China, India, Italy, Russia, and several other countries and also belongs to the Pontifical Academy of Sciences. He was first Chair of the U.S. Civilian Research and Development Foundation, a government-established organization that funds joint research with the independent countries of the former Soviet Union.

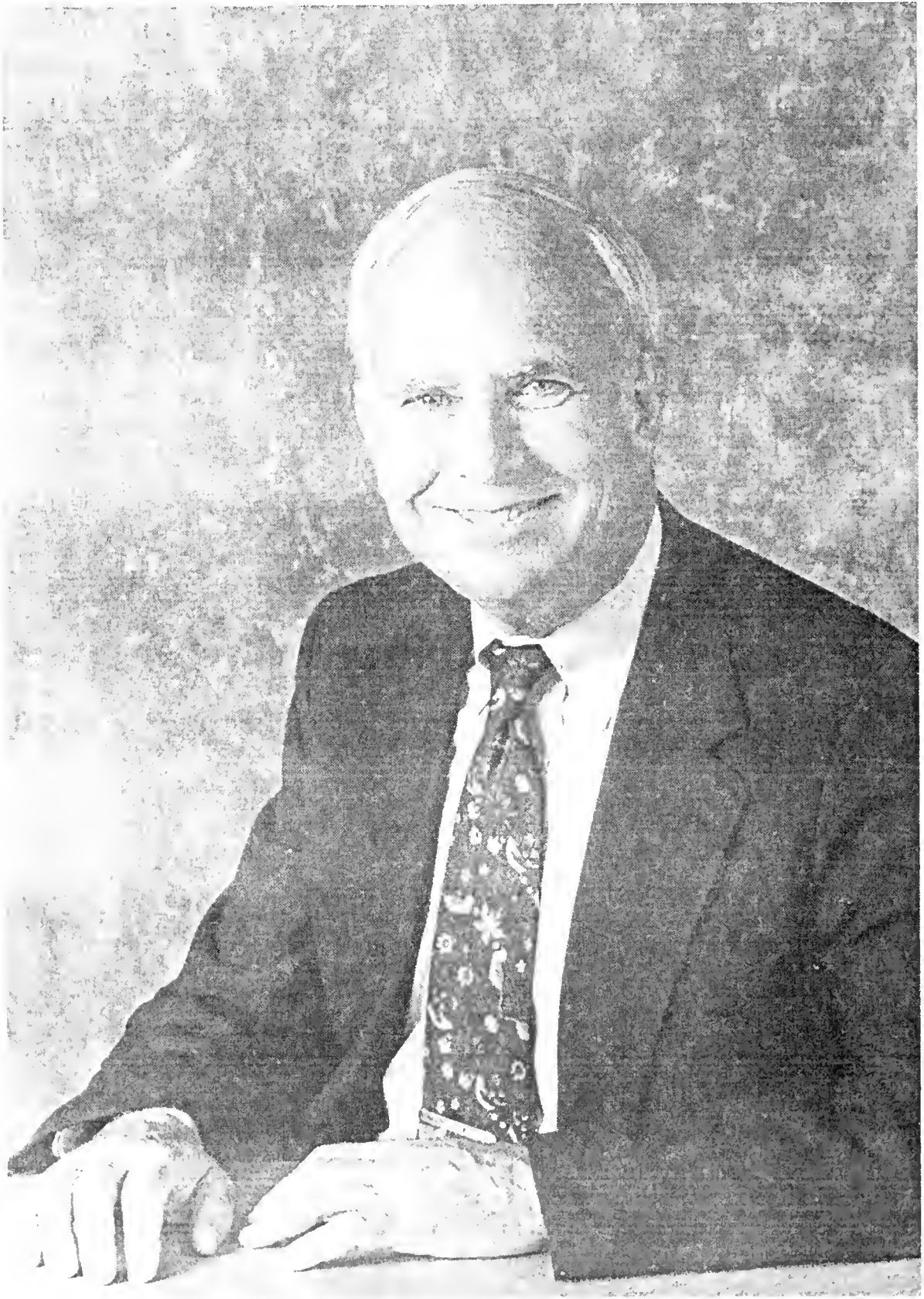
In August 1999, Dr. Raven brought to St. Louis the XVI International Botanical Congress, a global gathering of more than 5,000 botanists. Dr. Raven presided at the meeting and received the Engler Medal, in gold, for distinguished lifetime service to plant taxonomy. The meeting, held once every six years, last occurred in North America in 1969.

As a result of his work in science and conservation, Dr. Raven is the recipient of numerous prizes and awards, including the prestigious International Prize for Biology from the government of Japan; Environmental Prize of the Institut de la Vie; Volvo Environment Prize; Tyler Prize for Environmental Achievement; and the Sasakawa Environment Prize. He also has held Guggenheim and John D. and Catherine T. MacArthur Foundation Fellowships.

Dr. Raven is Co-editor of the *Flora of China*, a joint Chinese-American international project that is leading to a contemporary account on all the plants of China. He has written numerous books and publications, both popular and scientific, including *Biology of Plants* (co-authored with Ray Evert and Susan Eichhorn, Worth Publishers, Inc., New York), the internationally best-selling textbook in botany, now in its sixth edition, and *Environment* (Saunders College Publishing, Pennsylvania), a leading textbook on the environment.



Dr. Raven received his Ph.D. from the University of California, Los Angeles, in 1960 after completing his undergraduate work at the University of California, Berkeley.



Dr. Peter H. Raven

PROGRAM SUMMARY

With the exception of the Thursday Evening Social and the Friday On-line Education Workshop, all events will be held at the Radisson Hotel. A map showing the layout of the hotel with meeting rooms is included in this issue.

WEDNESDAY, APRIL 4

<b>ASB Executive Committee Meeting</b> , <i>Oak Room</i>	2:00-6:00 PM
<b>SABS Council Meeting</b> , <i>Fleur de lis 1</i>	3:00-7:00 PM
<b>ESA Celebration</b> , <i>Audubon A&amp;B</i>	5:00-7:00 PM
<b>Plenary Session– Welcome</b> , <i>Tulane Room</i>	7:00-7:30 PM
<b>Plenary Lecture – Dr. Peter Raven</b> , <i>Tulane Room</i>	7:30-8:30 PM
“Global biodiversity: current strategies for saving it”	
<b>ASB Welcoming Social</b> , <i>Exhibit Hall</i>	8:30-11:00 PM

THURSDAY, APRIL 5

<b>Continental Breakfast</b> , <i>Exhibit Hall</i>	7:00-8:00 AM
<b>ASB Past President’s Breakfast</b> , <i>Fleur de lis 1</i>	7:00 AM-8:30 AM
<b>Poster set-up</b> , <i>Exhibit Hall</i>	7:00-10:30 AM
<b>Poster viewing</b> , <i>Exhibit Hall</i>	10:30 AM-5:00 PM
<b>Slide Preview</b> , <i>Fleur de lis 2</i>	8:00 AM-5:00 PM
<b>Symposium:</b> “Lower Mississippi River and Coastal Louisiana: problems of the past, opportunities for the future” <i>Audubon E</i>	8:30 AM-Noon

Morning Paper Sessions

<b>Plant Ecology I</b> , <i>Audubon A&amp;B</i>	8:30 AM-Noon
<b>Plant Systematics I</b> , <i>Mimosa</i>	8:30 AM-Noon
<b>Invertebrate Biology</b> , <i>Magnolia</i>	8:30 AM-Noon
<b>Ichthyology I</b> , <i>Cypress</i>	8:30 AM-Noon
<b>SWS Luncheon Meeting</b> , <i>Fleur de lis 1</i>	Noon-1:30 PM

Afternoon Paper Sessions

<b>Aquatic Ecology I</b> , <i>Audubon E</i>	1:30-5:00 PM
<b>Plant Ecology II</b> , <i>Audubon A&amp;B</i>	1:30-5:00 PM
<b>Plant Systematics II</b> , <i>Mimosa</i>	1:30-5:00 PM
<b>Herpetology</b> , <i>Magnolia</i>	1:30-5:00 PM
<b>Ichthyology II</b> , <i>Cypress</i>	1:30-5:00 PM
<b>ASIH, SE Division Business Meeting</b> , <i>Cypress</i>	5:00-5:30 PM
<b>Southeast Fishes Council</b> , <i>Cypress</i>	5:30-6:00 PM
“Stomp in the Swamp” Evening Social at Louisiana Swamp Exhibit, Audubon Zoo (buses depart Radisson starting at 6:30PM)	
	7:00-10:00 PM

**FRIDAY, APRIL 6**

<b>Continental Breakfast</b> , <i>Exhibit Hall</i>	7:00-8:00 AM
<b>SABS/BSA Breakfast Meeting</b> , <i>Audubon D</i>	7:00 AM-8:30 AM
Slide Preview, <i>Fleur de lis 2</i>	8:00 AM-5:00 PM

<b>Beta Beta Beta</b> , <i>Fleur de lis 1</i>	
Officers Meeting	8:30-9:30 AM
Judges Meeting	8:30-9:30 AM
<b>Beta Beta Beta Business Meeting 1</b> , <i>Tulane Room</i>	10:30-11:30 AM

**Morning Paper Sessions**

Aquatic Ecology II, <i>Audubon E</i>	8:30-Noon
Plant Ecology III, <i>Audubon A&amp;B</i>	8:30-Noon
Plant Physiology/Teaching, <i>Mimosa</i>	8:30-Noon
Genetics, <i>Magnolia</i>	8:30-Noon
Microbiology/Development, <i>Cypress</i>	8:30-Noon

<b>ASB Business Meeting</b> , <i>Tulane Room</i>	Noon-1:30 PM
<b>ESA, SE Chapter Luncheon/Business Meeting</b> , <i>Audubon D</i>	Noon-2:30 PM

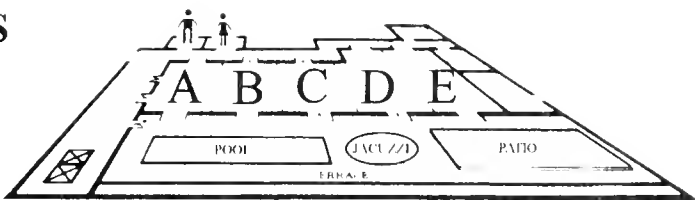
**Afternoon Paper Sessions**

Plant Ecology IV, <i>Audubon E</i>	2:30-5:00 PM
Aquatic Ecology III/Mammal/Bird, <i>Magnolia</i>	1:30-5:00 PM
Animal Physiology, <i>Cypress</i>	1:30-5:00 PM
<b>Workshop</b> : "On-line Educational Software", <i>Loyola University</i>	1:30-5:00 PM
<b>Symposium</b> : "Future of Plant Collections in the Southeast", <i>Mimosa</i>	1:30-5:00 PM
<b>Herbarium Curators Meeting</b> , <i>Mimosa</i>	5:00-6:00 PM
<b>Beta Beta Beta I</b> , <i>Audubon A</i>	1:30-4:30 PM
<b>Beta Beta Beta II</b> , <i>Audubon B</i>	1:30-4:30 PM
<b>Beta Beta Beta III</b> , <i>Audubon C</i>	1:30-4:30 PM
<b>Beta Beta Beta Meetings</b> , <i>Audubon A,B,C</i>	4:30-5:30 PM
<b>ASB Social Hour</b> , Cash Bar, <i>Tulane Room Foyer</i>	6:00-7:00 PM
<b>ASB Banquet</b> , <i>Tulane Room</i>	7:00-9:00 PM

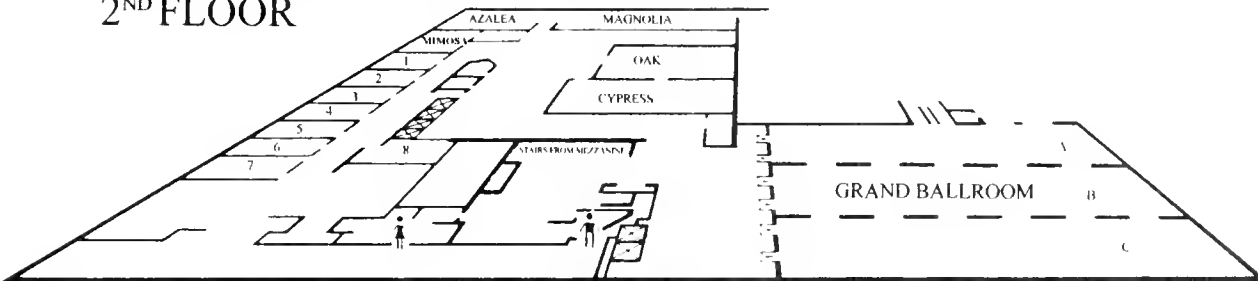
**SATURDAY, APRIL 7**

<b>ASB Executive Committee Breakfast and Meeting</b> , <i>Oak Room</i>	8:00-11:00 AM
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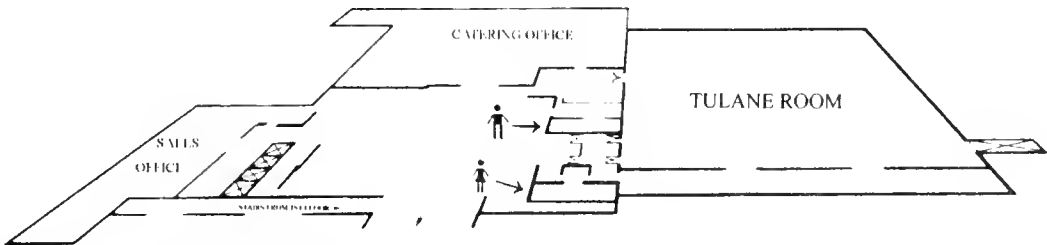
**AUDUBON SUITES**  
**6<sup>TH</sup> FLOOR**



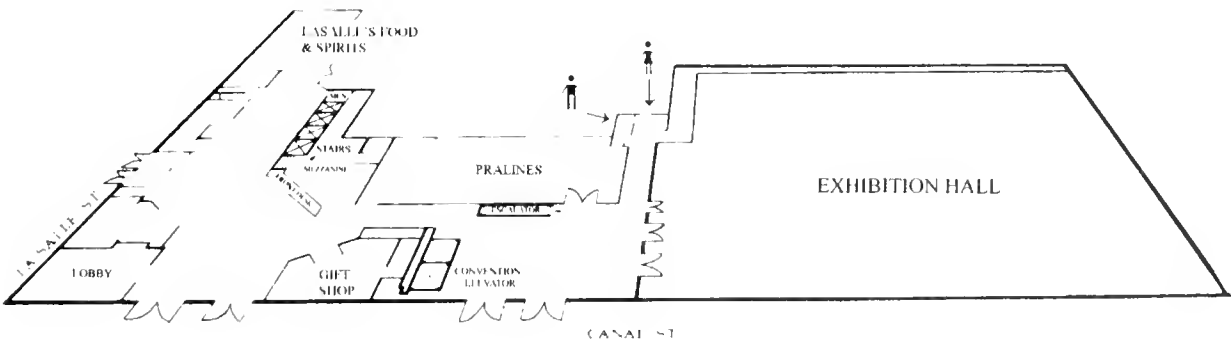
**CONFERENCE CENTER / GRAND BALLROOM**  
**2<sup>ND</sup> FLOOR**



**TULANE ROOM**  
**MEZZANINE LEVEL**



**EXHIBITION HALL**  
**1<sup>ST</sup> FLOOR**



## SYMPOSIA AND WORKSHOPS

The meeting will feature symposia on the future of herbaria in the southeast and the lower Mississippi River and coastal Louisiana, and a workshop on software products for biology instruction. Schedules for the symposia and the workshop are provided in the presentation schedule below.

The ASB 2001 Local Committee has organized a symposium entitled: "*Lower Mississippi River and Coastal Louisiana: challenges of the past and present, opportunities for the future*" (Thursday, April 5<sup>th</sup>, 8:30 AM-12:30 PM, *Audubon E*). The half-day symposium will feature invited talks by prominent Louisiana researchers on topics such as river-related hypoxia and toxic algae in the Gulf of Mexico; river biogeochemistry, and river floodplain and coastal wetland restoration.

The symposium "*Future of Plant Collections in the Southeast*" (Friday, April 6<sup>th</sup> 1:30-5:00 PM, *Mimosa*) will highlight the recent efforts in herbarium research and curation, and will provide a forum for interested scientists to discuss regional solutions to current problems associated with maintaining this national treasure.

The ASB Education Committee has organized a hands-on workshop of online educational software. Workshop participants will be able to use web-based software in "real-time" at computers connected to the Internet. Commercial vendors will demonstrate their on-line educational package(s). Following these demonstrations a college instructor who is currently using one of the on-line programs will discuss the successes, problems and modifications needed to implement the system in their course(s). The workshop will be held in a computing classroom on the Loyola University campus on Friday April 6<sup>th</sup> from 1:30 to 5:00 PM. Buses will transport workshop participants to and from the Radisson Hotel.

## JOIN IN THE CELEBRATION!

### SILVER ANNIVERSARY

of the

### SOUTHEASTERN CHAPTER

### ECOLOGICAL SOCIETY OF AMERICA

Wednesday evening social hour before the plenary session  
Friday luncheon recognizing charter members and  
chapter leaders, at the

**ASB Annual Meeting, April 4-7, New Orleans, LA**

For their contributions to the Chapter and ecology in the Southeast, special recognition will be extended to: Eugene P. Odum, Professor Emeritus, University of Georgia, and J. Frank McCormick, Professor Emeritus, University of Tennessee-Knoxville. Both will speak and receive recognition at the Friday luncheon.

ASB POSTER AND PAPER SESSIONS

Note: Some poster and paper numbers are missing or out of chronological order because of last-minute submissions or changes after the numbering system was developed.

POSTERS – EXHIBIT HALL

Posters displayed	10:30 AM-5 PM Thursday
	8:30 AM-4:30 PM Friday
Presenters with posters	10-11:30 AM Thursday
Dismantle posters	by 5 PM Friday

- 1    **JOHNSON, JAMES R.**<sup>1,2</sup> <sup>1</sup>Zoology Department, North Carolina State University, Raleigh, NC 27609 and <sup>2</sup>Bioinformatics, Paradigm Genetics, Inc., Research Triangle Park, NC 27709 – Latitudinal variation in morphometric development of Atlantic croaker, *Micropogonias undulatus*, in Western North Atlantic and Gulf of Mexico estuarine waters.
- 2    **CASHNER, MOLLIE F.** University of Southern Mississippi, Hattiesburg, MS 39406 – Responses of five common freshwater fishes to conspecific skin extract.
- 3    **GIBBONS, J. WHITFIELD.** University of Georgia's Savannah River Ecology Laboratory, Aiken, SC – Evaluating distribution and abundance patterns of herpetofauna based on five decades of sampling and one million individuals.
- 4    **WOOTEN, JESSICA, ARIANA BREISCH AND THOMAS K. PAULEY.** Marshall University, Department of Biological Sciences, Huntington, WV 25755 – SEM analysis of tooth morphology in some species of the family Plethodontidae.
- 5    **FELIX, ZACHARY, JESSICA WOOTEN, NANCY J. DICKSON, ROBERT FIORENTINO, ARIANA BREISCH, MIZUKI TAKAHASHI, AND THOMAS K. PAULEY.** Department of Biological Sciences, Marshall University, Huntington, WV 25755 – Nontarget Impacts on Terrestrial and Aquatic Salamanders from Insecticide Applications and Gypsy Moth Defoliation.
- 6    **HELPS, C.**<sup>1</sup>, **L. SPIETH**<sup>1</sup>, **J. PORTERFIELD**<sup>2</sup>, **AND D.C. HANEY**<sup>1</sup>. <sup>1</sup>Biology Dept., Furman University, Greenville, SC 29613 and <sup>2</sup>Centre College, Danville, KY 40422 – A study of body morphology and microhabitat use of several families of freshwater fish in the Enoree River Basin, SC.
- 7    **MITCHUM, A.**<sup>1</sup>, **D.C. HANEY**<sup>1</sup>, **W.B. WORTHEN**<sup>1</sup>, **AND J. PORTERFIELD**<sup>2</sup>. <sup>1</sup>Biology Dept., Furman University, Greenville, SC 29613 and <sup>2</sup>Centre College, Danville, KY 40422 – Fish distribution in the Enoree River, SC.
- 8    **COCKLIN, ROSS R., M. JASON TODD, AND MICHAEL E. DORCAS.** Davidson College, Davidson, NC 28036 – Temporal and spatial variation in anuran calling: Implications for conservation and monitoring programs.

- 9 **KRAL, LEOS G., STEPHEN M. BROGDON, SENETH D. FONSEKA, AND CHROSTOPHER R. TABIT.** Department of Biology, State University of West Georgia, Carrollton, GA 30117 – Phylogeography of the Tallapoosa Darter, *Etheostoma tallapoosae*.
- 10 **WILLIAMSON, SCOTT AND A. FLOYD SCOTT.** Department of Biology, Austin Peay State University, Clarksville, TN 37044 – Natural history notes on a recently discovered population of *Stemotherus minor peltifer* (Stripeneck Musk Turtle) in Whiteoak Creek, Houston and Humphreys counties, Tennessee.
- 11 **SCOTT, A. FLOYD AND SCOTT SUTTON.** Department of Biology, Austin Peay State University, Clarksville, TN 37044 – Distribution and movements of Alligator Snapping Turtles (*Macrochelys temminckii*) in the Tennessee portion of Kentucky Reservoir.
- 12 **DICKSON, NANCY J., KEITH A. JOHNSON, AND THOMAS K. PAULEY.** Department of Biological Sciences, Marshall University, Huntington, WV 25755 – A Comparison of Historical Blanchard's Cricket Frog Sites in Western West Virginia to Current Sites in Southeastern Ohio.
- 13 **LOUDERBACK, VALERIE ANN, AND REX MEADE STRANGE.** Department of Biology, Southeast Missouri State University, Cape Girardeau, MO 63701 – Male investment and reproductive strategy in the slabrock darter, *Etheostoma smithi*.
- 14 **MILLER, CLINTON E., MEGAN A. PARKER, AND MICHAEL K. MOORE.** Department of Biology, Mercer University, Macon, GA 31207 – Impacts of Forest Management Activities on reptiles and amphibians in the Piedmont National Wildlife Refuge.
- 15 **LAWRENCE, KAREN A. AND REX MEADE STRANGE.** Department of Biology, Southeast Missouri State University, Cape Girardeau, MO 63701 – Comparative neuroanatomy and reproductive strategies among percids.
- 16 **HYDE, LINDA L.<sup>1</sup> AND BRETT A. LARSON.<sup>2</sup>** <sup>1</sup>Division of Mathematics and Natural Sciences, Gordon College, Barnesville, GA 30204 AND <sup>2</sup>Biology Department, Armstrong Atlantic State University, Savannah, GA 31419 – Detection of melatonin in *Fundulus heteroclitus* using an ELISA.
- 17 **FOX, CECILIA M.<sup>1</sup>, DANIELLE M. SMITH<sup>1</sup>, AND WAYNE A. CASS<sup>2</sup>.** <sup>1</sup>Department of Biology, Wingate University, Wingate, NC 28174 and <sup>2</sup>Department of Anatomy and Neurobiology, University of Kentucky College of Medicine, Lexington, KY 40536 – Neurochemical analysis of the protective effects of antioxidant therapy in the rat model of Parkinson's disease.
- 18 **TODD, M. JASON<sup>1</sup>, KRISTINE L. GRAYSON<sup>1</sup>, WILLIAM A. HOPKINS<sup>2</sup>, ROBERT E. GATTEN, JR. <sup>3</sup>, AND MICHAEL E. DORCAS<sup>1</sup>.** <sup>1</sup>Dept. of Biology, Davidson College, Davidson, NC 280361; <sup>2</sup>Savannah River Ecology Lab, Aiken SC, 298022; <sup>3</sup>Dept. of Biology, University of North Carolina, Greensboro, NC 27412 – The effects of food type on specific dynamic action in the chocon horned frog (*Ceratophrys cranwelli*).



- 19 **MINIS, SARAH R., GLENN T. GHOLSTON, MATHIUS J. SEDIVEC.** Departments of Psychology and Biology, Appalachian State University, Boone, NC 28608 – Why enhancing cholinergic transmission may worsen deficits from basal forebrain lesions.
- 20 **WOODSIDE, MARIA V.** Southeastern Louisiana University, Hammond, LA 70402 – Xenobiotic estrogens and their effects on tadpole production of vitellogenin.
- 21 **EMRICK, VERL R., TYLER P. STANTON, AND REBECCA L. MURRAY.** Conservation Management Institute, Virginia Tech College of Natural Resources, Blacksburg, Virginia 24061 – Habitat selection of the Bachman's sparrow (*Aimophila aestivalis*) at Fort Pickett Maneuver Training Center, Virginia.
- 22 **HINKLE, C. ROSS AND PAUL A. SCHMALZER.** Dynamac Corporation, Kennedy Space Center, Florida – Environmentally Endangered Lands Acquisition and Conservation Program in Brevard County, Florida.
- 23 **STRAIT, S.G., AYOOB, R., AND S. SMITH.** Marshall University – Three-dimensional laser digitizing for visualization and quantification of fossil teeth.
- 24 **AGOSTA, SALVATORE J., AND DAVID MORTON.** Dept. Biology, Frostburg State University, Frostburg, MD 21532 – Spatial and temporal dietary variation by the big brown bat in Pennsylvania and western Maryland.
- 25 **BROWN, DAVID.** Ecology and Evolutionary Biology, Tulane University, New Orleans, LA 70118 – The effect of winter climate on breeding season population size of neotropical migrant songbirds.
- 26 **ALVERSON, JANET AND ALLEN C. COHEN.** U.S. Department of Agriculture, Agricultural Research Service, Biological Control and Mass Rearing Research Unit, Mississippi State, MS 39762-5367 – Effect of anti-fungal agents on biological fitness of *Lygus hesperus* Knight.
- 27 **TOWLER, WILLIAM I.<sup>1</sup>, JAVIER PONCE SAAVEDRA<sup>2</sup>, BENJAMIN GANTENBEIN<sup>3</sup>, AND VICTOR FET<sup>1</sup>.** <sup>1</sup>Dept. Biological Sciences, Marshall University, Huntington, WV 25755, <sup>2</sup>Facult. Biología, Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Michoacán, CP 58060 México, and <sup>3</sup>Institute of Zoology, University of Bern, CH-3012 Bern, Switzerland – Mitochondrial DNA systematics of Central Mexican *Centruroides* (Scorpiones: Buthidae).
- 28 **PURVIS, M.E. AND KHAN, R.N.** Department of Biology, Armstrong Atlantic State University, Savannah, GA – Effects of rostrum ablation on locomotion and prey capture by grass shrimp *Palaemonetes pugio*.
- 29 **JORGENSEN, DARWIN, TREVOR WILKES, AND LEA BEAULIEU.** Biology Dept., Roanoke College, Salem, VA 24153 – Respiratory support of submerged walking in the blue crab, *Callinectes sapidus*.
- 30 **BOHLMANN, TIFFANY A. AND PAMELA G. GREGORY,** Jacksonville State University – Reproductive biology of the ground cricket *Allonemobius socius*.
- 31 **NORMAN, MAI-KIM S.** Bowie State University, Bowie, MD 20715 – The microbial communities in graywater and graywater/blackwater bioreactors.

- 32 **ALLEN, L.<sup>1</sup>, R. KERSTETTER<sup>1</sup>, J. LESHER<sup>2</sup>, S. SCHAFFER<sup>1</sup>, L. PHAM<sup>1</sup>, M-K LIAO<sup>1</sup>.** <sup>1</sup>Biology Dept., Furman University, Greenville, SC 29613, and <sup>2</sup>Trinity University, San Antonio, TX 78212 – Effects of land use on fecal coliform levels in selected watersheds of the Enoree River, Upstate SC.
- 33 **PHAM, L.<sup>1</sup>, S. SCHAFFER<sup>1</sup>, R.E. KERSTETTER<sup>1</sup>, L. ALLEN<sup>1</sup>, AND J. LESHER<sup>2</sup>.** <sup>1</sup>Biology Dept., Furman University, Greenville, SC 29613, and <sup>2</sup>Trinity University, San Antonio, TX 78212 – The impact of rain on coliform bacterial counts in the Enoree River, SC.
- 34 **HUNDLEY, JESSICA L. AND ISAURE DE BURON.** Department of Biology, Converse College, Spartanburg, SC 29302 – Completed description of *Hypoechinorhynchus thermaceri* (Palaeacanthocephala) a parasite of the hydrothermal vent fish, *Thermarces cerberus* (Zoarcidae).
- 35 **LESHER, J. <sup>1</sup>, L. ALLEN<sup>2</sup>, AND R.E. KERSTETTER<sup>2</sup>.** <sup>1</sup>Trinity University, San Antonio, TX 78212, and <sup>2</sup>Biology Department, Furman University, Greenville, SC 29613 – Effect of sediment agitation on total coliform and *Escherichia coli* levels in the Enoree River, SC.
- 36 **BROOKS, HARRY, GINGER LAYNE, AND CHARLES SOMERVILLE.** Marshall University Department of Biological Sciences, Huntington, WV 25755 – Survey of antimicrobial activities in extracts of common plant materials.
- 37 **JORDAN, NIKISA S.<sup>1</sup>, MEHRAN PAZIRANDEH<sup>2</sup>.** <sup>1</sup>Dept of Biological Sciences, Bowie State University, Bowie, MD 20706 and <sup>2</sup>Center for Bio/Molecular Science and Engineering, Naval Research Laboratory, SW Washington D.C 20375 – Thioesterase I of *Escherichia coli*.
- 38 **SPIERS, J.A. <sup>1</sup>, KHAN, R.N. <sup>1</sup>, AND PUNG, O<sup>2</sup>.** <sup>1</sup>Department of Biology, Armstrong Atlantic State University, Savannah, GA. and <sup>2</sup>Georgia Southern University, Statesboro, GA. – Activity levels of grass shrimps, *Palaemonetes pugio*, influenced by parasitic trematodes *Microphallus turgidus*.
- 39 **WEILAND, DANIEL M. AND LEON L. LUNDIE Jr.** Appalachian State University, Boone, NC 28607 – Nutrient dependent production of novel antibacterial compounds by putative brittle star subcuticular bacteria.
- 40 **WHITE, RHONDA M. AND MARTHA J. POWELL.** The University of Alabama, Tuscaloosa, AL 35401 – Oomycete infections of turtles.
- 41 **WILSON, CYNTHIA, MARK MEADE AND CHARLES OLANDER.** Department of Biology, Jacksonville State University, Jacksonville, AL 36265 – Sublethal effects of Phloxine B on population growth kinetics and aerobic metabolic rates in *Tetrahymena* spp.
- 42 **DOFFITT, CYNTHIA M.<sup>1</sup>, JOY M. HOLT<sup>1</sup>, EARL H. WEIDNER<sup>2</sup>, AND ANN M. FINDLEY<sup>1</sup>.** <sup>1</sup>Dept. of Biology, University of Louisiana at Monroe, Monroe, LA 71209; <sup>2</sup>Dept. of Biological Sciences, Louisiana State University, Baton Rouge, LA 70803 – Early Carbohydrate Metabolism and Aerobic Enzyme Analysis of *Spraguea lophii* (Microsporidia).

- 43 **ODOM, ALLISON, ANDREA WOLFE, AND JAMES RAYBURN.** Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 – Effects of Medlazine on Developing Embryos of the Grass Shrimp *Palaemonetes pugio*.
- 44 **JETER, DIONNA T.** The Center for the Integrative Study of Animal Behavior, Indiana University at Bloomington, Bloomington, Indiana 40746 – The effect of chemosensory predator cue on morphological characters and escape behavior on *Hyla chrysoscelis*.
- 45 **LOCKETT, JARON.** Minority International Research & Training, Egerton University, Kenya – An Investigation of Pesticide Residues in Water, Fish, and Sediment, from Lake Naivasha, Kenya.
- 46 **BUSBEE, STEVEN\* AND WILLIAM H. CONNER.** Department of Forest Resources, Clemson University, Clemson, SC 29634 and Baruch Institute of Coastal Ecology and Forest Science, Georgetown, SC 29442 – An Ecological Characterization of Three Seasonally Flooded Isolated Ponds on the Waccamaw Neck, South Carolina.
- 47 **HARPER, CARLA., ROGER SAUTERER, AND JAMES RAYBURN.** Department of Biology, Jacksonville State University, Jacksonville, AL 36265 – Preliminary analysis of water and sediment extracts from Logan Martin and Guntersville lakes, AL, by the FETAX developmental toxicity assay.
- 48 **CARTER, LISA A<sup>1,2</sup>, JAMES C. BONNER<sup>2</sup>, AND LISA A. BONNER<sup>1</sup>.** <sup>1</sup>Peace College, Raleigh, N.C. 27604 and <sup>2</sup>National Institute of Environmental Health Sciences, Research Triangle Park, N.C. 27709 – Mitogen-activated protein (MAP) kinase activation as an indicator of environmental stress in an amphibian cell culture model.
- 49 **HOYER, ERIK W., TAMMIE BEYERL, MARGARET MINZNER, LISA BRENNAN, AND BETH MIDDLETON.** Department of Plant Biology, Southern Illinois University, Carbondale, IL 62911 – Functional analysis of planted, regenerated, and old-growth cypress wetlands along the Cache River, Illinois.
- 50 **WRIGHT, KEITH <sup>1,2</sup>, WENDELL R. HAAG<sup>1,3</sup>, LAWRENCE SHAFFER<sup>2</sup>, MELVIN L. WARREN, JR<sup>3</sup>, AND MARJORIE HOLLAND<sup>1,2</sup>.** <sup>1</sup>Biology Department, University of Mississippi, University, MS 38677, <sup>2</sup>University of Mississippi Field Station, Abbeville, MS 38601, and <sup>3</sup>Center for Bottomland Hardwoods Research, USDA Forest Service, Oxford, MS 38655 – Freshwater mussels of the Cypress Creek watershed (Little Tallahatchie drainage): A representative watershed in North Mississippi.
- 51 **GRIFFITH, ANGELA M.<sup>1</sup> AND KENNETH G. RICE<sup>2</sup>.** <sup>1</sup>Dept. of Biology, Appalachian State University, Boone, NC 28608 and <sup>2</sup>USGS Biological Resource Division, Everglades National Park, Homestead, FL 33034 – Stomach analysis of South Florida alligators, *Alligator mississippiensis*.
- 52 **BEVILLE, SHELLEY AND GARY P. SHAFFER.** Southeastern Louisiana University, Hammond, LA 70401 – The influence of the Amite River Diversion Canal in Southeastern Louisiana on the natural regeneration of baldcypress (*Taxodium distichum* (L.) Rich.): a dendrochronological analysis.

- 53 **FELTEN, J.<sup>1</sup>, W.B. WORTHEN<sup>1</sup>, AND C.B. ANDERSEN<sup>2</sup>.** <sup>1</sup>Biology Dept., and <sup>2</sup>Earth and Environmental Sciences Dept., Furman University, Greenville, SC 29613 – Biological description of Enoree River (SC) tributaries: Effects of water chemistry and habitat on abundance of *Progomphus obscurus*.
- 54 **HUNTER, AMY E.<sup>1</sup>, AND SAMUEL P. FAULKNER<sup>2</sup>.** <sup>1</sup>Dept. Biological Sciences, University of Alabama, Tuscaloosa, AL 35401 and <sup>2</sup>Dept. Biological Sciences, Delta State University, Cleveland, MS 38733 – Vegetation patterns in sawgrass inlet marshes in Mobile Bay, Alabama: possible effects of natural and anthropogenic hydrologic alteration.
- 55 **GOODWILL, THOMAS R., WILLIAM L. SEDDON, AND NATHAN METZ.** Frostburg State University, Frostburg, MD 21532 – Effects of manganese (Mn++) on the hematology of brook trout (*Salvelinus fontinalis*).
- 56 **O'DANIEL, E.<sup>1</sup>, L. FIKES<sup>1</sup>, W.B. WORTHEN<sup>2</sup>, D.C. HANEY<sup>2</sup>, AND C.B. ANDERSEN<sup>3</sup>.** <sup>1</sup>Hendrix College, Conway AR 72032, <sup>2</sup>Biology Department, and <sup>3</sup>Earth and Environmental Sciences Department, Furman University, Greenville, SC 29613 – Comparison of diversity and abundance of larval odonate populations in rural and urban streams in the Enoree River watershed, SC.
- 57 **OWENS, JANNA S., ROBERT A. ANGUS, AND KEN R. MARION.** University of Alabama at Birmingham – A refinement of sediment-sensitive aquatic macroinvertebrate metrics.
- 58 **ADAMS, SUSAN B., MELVIN L. WARREN JR., AND WENDALL R. HAAG.** USDA Forest Service, Southern Research Station, Oxford, MS 38655 – Temporal variation in the fish assemblages of three Upper Coastal Plain streams in Mississippi.
- 59 **CONNER, AMANDA, M. AND DAVID J. CROWLEY.** Biology Department, Mercer University, Macon, GA 31207 – Transcription-coupled repair of ultraviolet light-induced DNA damage in the halophilic archaeon, *Halobacterium* sp. NRC-1.
- 60 **HENSON, BRIAN J., SUSAN R. BARNUM, AND LINDA E. WATSON.** Department of Botany, Miami University, Oxford, OH 45056 – Evolution of the nitrogen fixation gene *nifD* in heterocystous cyanobacteria.
- 61 **DAVIS, LUCY E. AND DAVID J. CROWLEY.** Biology Department, Mercer University, Macon, GA 31207 – Role of the RAD51/recA homolog *radA* in UV-induced mutagenesis in the extremely halophilic archaeon, *Haloferax volcanii*.
- 62 **JONES, MARY D.<sup>1,2</sup>, CHAD C. LOCKLEAR<sup>3</sup>, RICHARD BUCHHOLZ<sup>4</sup>, STEPHEN J. HECHT<sup>5</sup>, AND ANN M. FINDLEY<sup>2</sup>.** <sup>1</sup>North Louisiana Criminalistics Laboratory, Shreveport, LA 71101; <sup>2</sup>Dept. of Biology, University of Louisiana at Monroe, Monroe, LA 71209; <sup>3</sup>MWG Biotech, Inc., High Point, NC 27265; <sup>4</sup>Dept. of Biology, University of Mississippi, University, MS 38677; <sup>5</sup>Dept. of Microbiology and Medical Sciences, Grand Valley State University, Allendale, MI 49401 – Production of a MHC Class II Molecular Probe for the Wild Turkey, *Meleagris gallopavo*.

- 63 **MILLER, JEREMY R., BRANDON CHAPMAN, JENNIFER HUGHES, JOHN SKAGGS AND C. BRIAN ODOM.** Department of Biology, Wingate University, Wingate, NC 28174 – Application of RAPD PCR to identify genetic polymorphisms in the beaver, *Castor canadensis*.
- 64 **TUSON, MICHELLE, DANIEL VINES, AND CHRISTI MAGRATH.** Dept. of Biological and Environmental Sciences, Troy State University, Troy, AL 36082 – Analysis of transcription termination levels from the intergenic regions of Chromosome III in *Saccharomyces cerevisiae*.
- 65 **BRADLEY, KIANA, LAURI FRAZIER, AND CHRISTI MAGRATH.** Dept. of Biological and Environmental Sciences, Troy State University, Troy, AL 36082 – Levels of transcription from a galactose inducible promoter correlate with galactose levels in *Saccharomyces cerevisiae*.
- 66 **MORRIS, MICHAEL W., IRENE KOKKALA, THOMAS H. FOX, AND MARK S. DAVIS.** Dept. Biology, North Georgia College & State University, Dahlonega, GA 30597 – Enhancing field experiences with undergraduate oral presentations.
- 67 **RAMP, PAUL AND TERESA FULCHER.** Dept. of Natural and Behavioral Sciences, Pellissippi State Technical Community College, Knoxville, TN 37933 – Computer based investigative laboratory experiences for distance learners in biology.
- 68 **FIORILLO, RICCARDO<sup>1</sup> AND CHRISTOPHER M. TAYLOR<sup>2</sup>.** <sup>1</sup>Division of Natural Sciences, Shorter College, Rome, GA 30165 and <sup>2</sup>Dept. of Biological Sciences, Mississippi State University, Mississippi State, MS 39762 – Effects of size-selective predation on life-history strategy in the western mosquitofish *Gambusia affinis*.
- 69 **WEIGANT, PATRICIA L.** Peace College, Raleigh, NC 27604 – Morphological variation in *Alettris* (Nartheciaceae) in North America.
- 70 **KARAMAN, VESNA AND L. E. URBATSCH,** Louisiana State University, Baton Rouge, LA, 70803 – Phylogenetic analysis of *Boltonia* (Astereae, Asteraceae) based on ETS and ITS sequence data.
- 71 **LICKEY, EDGAR B., KAREN W. HUGHES, AND RONALD H. PETERSEN.** Department of Botany, University of Tennessee, Knoxville, TN 37996-1100 – Phylogeography of *Clavicornia pyxidata* (Homobasidiomycete).
- 72 **FARMER, SUSAN B.** University of Tennessee, Knoxville, TN 37996-1100 – Phytogeographic survey of Trilliaceae.
- 73 **WEBER, JOHN S. AND A. JOSEPH POLLARD.** Dept. of Biology, Furman University, Greenville, SC 29613 – An allozyme study of the endangered aquatic plant *Sagittaria fasciculata*.
- 74 **DERAIMO, DAVID, SHERRINE IBRAHIM, AND JAGAN VALLURI.** Division of Biological Sciences, Marshall University, Huntington, WV 25755 – Changes in protein patterns in gravistimulated pea stems.

- 75 **IBRAHIM, SHERRINE A., DAVID DERAIMO, AND DR. JAGAN V.VALLURI.** Dept. Biological Sciences, Marshall University, Huntington, WV 25755 – Regulation of gene expression in gravistimulated pea stems, *Pisum sativum*.
- 76 **MCCOY, JOE-ANN, CLEMSON UNIVERSITY, NCSU, YELLOW CREEK BOTANICAL INSTITUTE** – Propagation of Threatened Native Medicinal Plants.
- 77 **FRANKLIN, MISTY A. AND JON M. STUCKY.** North Carolina State University, Raleigh, NC 27695-7612 – Reproductive ecology of *Lysimachia asperulaefolia*: an examination of seed production in natural populations.
- 78 **CONNER, WILLIAM H. AND TOMMY SOCHA.** Baruch Institute of Coastal Ecology and Forest Science, Georgetown, SC 29442 and U.S. Army Corps of Engineers, Charleston, SC – The use of native plant species to control erosion on an Intracoastal Waterway spoil bank.
- 79 **PÉREZ, HECTOR E.** University of Florida, Gainesville, FL 110670 – A germination protocol for *Harrisia fragrans* Small ex Britton & Rose (Cactaceae), a federally listed endangered plant in Florida.
- 80 **THOMAS, KEENA L.<sup>1</sup>, KELLY E. DOYLE<sup>2</sup>. AND W. DEAN COCKING<sup>3</sup>.** <sup>1</sup>Dept. Medicine-Pathology (clinical), University of Virginia, Charlottesville, VA 22908-0214, <sup>2</sup>School of Medicine, Medical College of Virginia, Richmond, VA 23284, <sup>3</sup>Department of Biology, James Madison University, Harrisonburg, VA 22807 – Translocation of mercury from Hg contaminated floodplain soils into *Daucus carota*, wild carrot, seedlings under plant growth chamber conditions.
- 81 **DAVIS, CHRISTOPHER M. <sup>1</sup>, AND DONALD J. DRAPALIK<sup>2</sup>.** <sup>1</sup>Dept. of Botany, Miami University, Oxford, OH 45056 and <sup>2</sup>Dept. of Biology, Georgia Southern University, Statesboro, GA 30460 – Endomycorrhizal fungi in *Elliottia racemosa*.
- 82 **HULL, JAMES C. AND CAROLINE S. GARRETT.** Biological Sciences, Towson University, Towson, MD 21252, and Biology, Transylvania University, Lexington, KY 40508 – Photosynthetic induction of early and late successional tree seedlings.
- 83 **LYTTLE, NIKKI L., FRANK S. GILLIAM, AND CHARLES C. SOMERVILLE.** Dept. Biological Sciences, Marshall University, Huntington, WV 25755, USA – Factors influencing spatial variability in soil nitrogen (N) dynamics in N-treated and untreated watersheds of the Fernow Experimental Forest, West Virginia.
- 84 **BEITING, STEVEN W., AND JOHN L VANKAT.** Dept. of Botany, Miami University, Oxford, OH 45056 – Successional dynamics of forests in south-central Alaska.
- 85 **NELMS, MELISSA, ALICIA HIGHSMITH, ERIN VRZAL, AND MARK BASINGER.** Dept. Biological and Physical Sciences, Barton College, Wilson, NC 27893 – Effect of water depth on plant species composition in emergent marshes in the vicinity of Wiggins Mill Reservoir, Wilson County, North Carolina.
- 86 **BASINGER, MARK A.<sup>1</sup> AND JODY P. SHIMP<sup>2</sup>.** <sup>1</sup>Dept. Biological and Physical Sciences, Barton College, Wilson, NC 27893 and <sup>2</sup>Illinois Dept. Natural Resources, Golconda, IL 62938 – Status and management of Chinese yam (*Dioscorea oppositifolia* L.) in Illinois.

- 87 **SLAPCINSKY, JODI L.<sup>1</sup>, DORIA R. GORDON<sup>1</sup>, GREG S. SEAMON<sup>2</sup> AND BEATRIZ PACE<sup>3</sup>.** <sup>1</sup>The Nature Conservancy, P.O. Box 118526, Gainesville, Florida 32611, <sup>2</sup>The Nature Conservancy, P.O. Box 393, Bristol, FL 32321, and <sup>3</sup>The Nature Conservancy, 222 E. Stuart Avenue, Lake Wales, Florida 33853 – Restoration of structure and composition of a degraded sandhill community with fire at Apalachicola Bluffs and Ravines Preserve, Liberty County, Florida.
- 88 **MAYRHOFER, MARIA, ZACK E. MURRELL, and RAY S. WILLIAMS.** Appalachian State University – Demography and reproductive ecology of the imperiled Heller's Blazing Star.
- 89 **SMAW, SHERCODA, LAFAYETTE FREDERICK, AND RAYMOND L. PETERSEN.** Biology Department, Howard University, Washington, D.C. 20059 – The urban moss *Bryum capillare* Hedw.: cyanobacterial and algal associates as biogenic crusts.
- 90 **PRICE, CHUCK AND JAKE WELTZIN** University of Tennessee, Knoxville, TN 37920 – The efficacy of prairie restoration in Cades Cove, Smoky Mountain National Park.
- 91 **WARRINER, MICHAEL D. AND T. EVAN NEBEKER.** Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS 39762 – Ground beetles (Coleoptera: Carabidae) in greentree reservoirs and naturally flooded bottomland hardwood forests.
- 102 **DRAKE, SARA J. <sup>1</sup>, JAKE F. WELTZIN<sup>1</sup> AND PATRICIA D. PARR<sup>2</sup>.** <sup>1</sup>Department of Ecology and Evolutionary Biology, The University of Tennessee, Knoxville, TN 37996 and <sup>2</sup>Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831 – Assessment of non-native invasive plants on the National Environmental Research Park at Oak Ridge National Laboratory.
- 309 **STEELE, EDNA<sup>1</sup> AND NIKKI MAPLES<sup>2</sup>.** <sup>1</sup>Department of Biology, Converse College, Spartanburg, South Carolina 29302 and <sup>2</sup>Clemson University Institute of Environmental Toxicology, Pendleton, SC 29670 – Occurrence of a dilepidid metacestode in the body cavity of the mummichog (*Fundulus heteroclitus*).

## THURSDAY, APRIL 5, 2001

### THURSDAY MORNING PAPER SESSIONS

#### Mississippi River Symposium – Audubon E

- 8:30 92 **BART, HENRY L, JR.<sup>1</sup> AND DAVID A. WHITE<sup>2</sup>.** <sup>1</sup>Tulane Museum of Natural History, Belle Chasse, LA, <sup>2</sup>Department of Biological Sciences, Loyola University, New Orleans, LA 70118 – Introduction to the symposium.



- 8:45 93 **BIANCHI, THOMAS<sup>1</sup>, S., MARTHA SUTULA<sup>1</sup>, AND BRENT A. MCKEE<sup>c</sup>.** <sup>1</sup>Dept. of Ecology and Evolution, Institute for Earth and Ecosystem Sciences, Tulane University, New Orleans, LA 70118 and <sup>2</sup>Dept. of Geology, Institute for Earth and Ecosystem Sciences, Tulane University, New Orleans, LA 70118 – Seasonal storage of sediments and carbon cycling the lower Mississippi River.
- 9:15 94 **RABALAIS, NANCY N.** Louisiana Universities Marine Consortium, Chauvin, LA 70344 – Hypoxia in the Gulf of Mexico and Linkages with the Mississippi River.
- 9:45 95 **DORTCH, QUAY.** Louisiana Universities Marine Consortium, 8124 Highway 56, Cocodrie, LA 70344 – Harmful algal blooms in Louisiana coastal waters: a result of eutrophication and a threat to human and ecosystem health
- 10:15 **BREAK**
- 10:30 96 **SHAFFER, GARY P.<sup>1</sup>, AND JAMES. G. GOSSELINK<sup>2</sup>.** <sup>1</sup>Dept. Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 and <sup>2</sup>Center for Wetlands Resources, Louisiana State University, Baton Rouge, LA 70803 – Characterization, degradation, and restoration of the Mississippi River alluvial plain.
- 11:00 97 **REED, DENISE, J,** Dept. Geology & Geophysics, University of New Orleans, New Orleans, LA 70148 – Using the Mississippi to Restore Coastal Louisiana: the greatest opportunity and the greatest challenge
- 11:30 98 **TWILLEY, ROBERT R. AND VICTOR RIVERA-MONROY.** Center for Ecology and Environmental Technology, University of Louisiana at Lafayette, Lafayette, LA 70504 – Developing Conceptual Models of Coastal Wetland Restoration in River Dominated Environments
- 12:00 **DISCUSSION AND CLOSING REMARKS**

### Plant Ecology 1 – Audubon A & B

- 8:30 99 **LHOTKA, JOHN M. AND JAMES J. ZACZEK.** Southern Illinois University, Carbondale, Illinois 62901 – The enhancement of oak regeneration through the use of mechanical incorporation of acorns in a mixed-oak upland forest in southern Illinois.
- 8:45 100 **SHARMA, G. K. AND DEBORAH A. DAVIS.** Dept. Biological Sciences, University of Tennessee at Martin, Martin, TN 38238 – Adaptations in leaf morphology and cuticular dynamics in *Parthenocissus quinquefolia* L. in response to environmental pollution.
- 9:00 101 **HERBERT, BRANDON T. AND FRANK P. DAY.** Dept. Biological Sciences, Old Dominion University, Norfolk, VA 23529 – Triphenyl-tetrazolium chloride as an indicator of root vitality in a scrub-oak ecosystem in central Florida: implications for minirhizotron technology.

- 9:15 102 **DRAKE, SARA J.<sup>1</sup>, JAKE F. WELTZIN<sup>1</sup> AND PATRICIA D. PARR<sup>2</sup>.** <sup>1</sup>Department of Ecology and Evolutionary Biology, The University of Tennessee, Knoxville, TN 37996 and <sup>2</sup>Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831 – Assessment of non-native invasive plants on the National Environmental Research Park at Oak Ridge National Laboratory.
- 9:30 103 **STALTER, RICHARD AND ERIC E. LAMONT.** Department of Biological Sciences, St. John's University, Jamaica, New York 11439 – The vascular flora of Jamaica Bay Wildlife Refuge, New York.
- 9:45 104 **DAY, FRANK P., JOHN J. DILUSTRO, AND BRANDON T. HERBERT.** Dept. Biological Sciences, Old Dominion University, Norfolk, VA 23529 – Response of roots to more than 4 years of exposure to elevated atmospheric CO<sub>2</sub> in an oak-scrub ecosystem in central Florida.
- 10:00 105 **SCHMALZER, PAUL A.<sup>1</sup> AND F.W. ADRIAN<sup>2</sup>.** <sup>1</sup>Dynamac Corporation, DYN-2, Kennedy Space Center, FL 32899, and <sup>2</sup>Merritt Island National Wildlife Refuge, P.O. Box 6504, Titusville, FL 32782 – Survival and growth of scrub oaks and saw palmetto planted in a former agricultural site.
- 10:15 **BREAK**
- 10:30 106 **HEYEL, SUSAN M. AND FRANK P. DAY.** Dept. of Biological Sciences, Old Dominion University, Norfolk, VA 23529 – Long term residual effects of nitrogen addition on a barrier island dune ecosystem.
- 10:45 107 **FRANCKO, DAVID A.** Department of Botany, Miami University, Oxford, OH 45056 – Palm cultivation in SW Ohio: Quantitative assessment of winter damage, mortality, and recovery.
- 11:00 108 **WANG, WEI.** Department of Biology, University of Memphis, Memphis, TN 38152 – Acorn loss and seedling establishment in Liaodong oak (*Quercus liaotungensis* Koidz.) in Dongling Mountain, Northern China.
- 11:15 109 **WALLY, ALAA L.** Archbold Biological Station, 123 Main Drive, Venus, FL 33960 – Challenges of conserving a critically endangered pitcher plant.
- 11:30 110 **HELD, MICHAEL E.<sup>1</sup> AND SUSAN JONES-HELD<sup>2</sup>.** <sup>1</sup>Saint Peter's College, Jersey City, NJ 07306 and <sup>2</sup>King's College, Wilkes-Barre, PA 18711 – A re-examination of the forest community at Hickory Run State Park, Carbon County, Pennsylvania.
- 11:45 111 **RUSSELL, COLIN A., BRENDAN T. LUCEY, AND LESLIE A. REAL.** Department of Biology, Emory University, Atlanta, GA 30322 – Spatial dynamics of dogwood anthracnose in the eastern United States.

## Plant Systematics 1 – Mimosa

- 8:30 112 **FLAGG, RAYMOND O.<sup>1</sup>, AND GERALD L. SMITH<sup>2</sup>.** <sup>1</sup>Carolina Biological Supply Company, Burlington NC 27215-3398 and <sup>2</sup>High Point University, High Point NC 27262-3598 – Characters and distributions of *Zephyranthes* species in the USA.
- 8:45 113 **KEENER, BRIAN R.** University of Alabama, Tuscaloosa, AL 35487 – Vascular Flora of Blount County, Alabama.
- 9:00 114 **ANDERSON, LORAN C.** Dept. Biological Science, Florida State University, Tallahassee, FL 32306 – Nassau County, Florida, a botanical “black hole.”
- 9:15 115 **SMALL, RANDALL L.** Dept. of Botany, The University of Tennessee, Knoxville, TN 37996-1100 – Morphological and genetic variation in *Hibiscus* sect. *Muenchhusia* (Malvaceae).
- 9:30 116 **WATSON, LINDA E.<sup>1</sup>, TIMOTHY M. EVANS<sup>2</sup>, AMY B. KORNKVEN<sup>1</sup>, MATTHEW M. UNWIN<sup>1</sup>, AND PAUL L. BATES<sup>3</sup>.** <sup>1</sup>Department of Botany, Miami University, Oxford, OH 45056; <sup>2</sup>Biology Department, Hope College, Holland, MI 49422; and <sup>3</sup>Biological Sciences Division, University of Nebraska-Lincoln, Lincoln, NE 68588 – Phylogenetic relationships of *Artemisia* and its allies (Asteraceae), based on molecular data.
- 9:45 117 **MARTIN, BRIAN H., MICHAEL WOODS, AND ALVIN R. DIAMOND JR.** Department Biological and Environmental Sciences, Troy State University, Troy, AL 36082 – The Vascular Flora of Coffee County, Alabama.
- 10:00 118 **PENNINGTON, TIFFANY AND MICHAEL WOODS.** Department of Biological and Environmental Sciences, Troy State University, Troy AL 36082 – The Vascular Flora of Dale County, Alabama.
- 10:15 **BREAK**
- 10:30 119 **HALL, JAMES A., MICHAEL WOODS, AND ALVIN R. DIAMOND JR.** Department of Biological and Environmental Sciences, Troy State University, Troy, AL 36082 – The Vascular Flora of the Pike County Pocosin Nature Preserve, Alabama.
- 10:45 120 **REESE, NANNETTE.** University of Alabama, Biodiversity and Systematics, Box 870345, Tuscaloosa, AL 35487 – A cladistic analysis of *Echinodorus*, with emphasis on the placement of *E. floridanus* (Alismataceae).
- 11:00 121 **LYNCH REGINA S., REBECCA BRAY AND LYTTON MUSSELMAN** Department of Biological Sciences, Old Dominion University, Norfolk, VA 23529-0266 – A morphological investigation of some tetraploid *Isoetes* populations of the eastern United States.

- 11:15 122 **PELL, SUSAN K. AND LOWELL URBATSCH**, Department of Biological Sciences, Louisiana State University – Evaluation of evolutionary relationships in the cashew family using chloroplast DNA sequence data.
- 11:30 123 **SHAW, JOEY T. AND B. EUGENE WOFFORD**, The University of Tennessee, Knoxville 37996-1100 – The woody plants of the Big South Fork National River and Recreation Area (BSFNRRRA), Tennessee & Kentucky.
- 11:45 124 **HEAFNER, KERRY D., R. JAMES HICKEY, AND LINDA E. WATSON**. Department of Botany, Miami University, Oxford, Ohio 45056 – Systematic studies of the *Isoetes melanopoda* Gay & Durieu assemblage in North America.

**Invertebrate Biology – Magnolia**

- 8:30 125 **CANCELLED**
- 8:45 126 **ROGERS, PATRICIA C., MICHELLE HERRELL, JAMES E. JOY**. Dept. Biological Sciences, Marshall University, Huntington, WV 25755 – Growth rates of carrion fly larvae under field conditions in southwestern West Virginia.
- 9:00 127 **BAUER, RAYMOND T.** Dept. Biology, University of Louisiana at Lafayette, Lafayette, LA 70504-2451 – Male mating strategies of decapod shrimps: mate guarding versus pure searching.
- 9:15 128 **HINTON, JULIANA AND HARRY MEYER**. Dept. Biological / Environmental Sciences, McNeese State University, Lake Charles, LA 70609 – Tardigrades of Mississippi.
- 9:30 129 **ESTEP, M. C., RICHARD N. HENSON, AND MARY U. CONNELL**. Appalachian State University, Boone, NC 28608 – Phylogeography of the Desert Scorpion: *Paruroctonus utahensis* Williams, using 16S rDNA Sequence.
- 9:45 130 **HENSON R.N.** Appalachian State University, Boone, NC 28608 – Behavior, distribution and habitat selection of Texas scorpions.
- 10:00 131 **BOST, KAREN C., MARY U. CONNELL, AND RICHARD N. HENSON**. Dept. of Biology, Appalachian State University, Boone, NC 28608 – Molecular comparisons of four sympatric scorpion species of the genus *Vaejovis* (*V. coahuilae*, *V. russelli*, *V. globosus*, *V. crassimanus*) using a 500 base pair sequence of mitochondrial 16S rDNA.
- 10:15 **BREAK**

- 10:30 132 **STEWART, KEVIN D.<sup>1</sup>, CHARLES H. NELSON<sup>2</sup>, RICHARD M. DUFFIELD<sup>1</sup>.** <sup>1</sup>Dept. Biology, Howard University, Washington, D.C. 20059 and <sup>2</sup>Dept. Biological and Environmental Sciences The University of Tennessee at Chattanooga, Chattanooga, TN 37403 – Novel Occurrence of Stoneflies (Plecoptera) in the Diet of the Red-Spotted Newt, *Notophthalmus viridescens*.
- 10:45 133 **PLESZEWSKI, ROBERT J., AND RAY S. WILLIAMS.** Appalachian State University, Boone, NC 28608 – Analysis of cliff-face microarthropod communities.
- 11:00 134 **MATTINGLY<sup>1</sup>, SHANNA, FRANK A. ROMANO<sup>1</sup>, AND DIANE R. NELSON<sup>2</sup>.** <sup>1</sup>Jacksonville State University, Jacksonville, AL, 36265, <sup>2</sup>East Tennessee State University, Johnson City, TN – A survey of terrestrial tardigrades on Dauphin Island, Alabama.
- 11:15 135 **PETERSON, LYNSEY R. AND A. JOSEPH POLLARD.** Dept. of Biology, Furman University, Greenville, SC 29613 – *Spread of metals through an invertebrate food chain as influenced by a nickel-hyperaccumulating plant, Alyssum pintodasilvae.*
- 11:30 136 **SOUTHER, REBECCA F.<sup>1</sup>, GARY P. SHAFFER<sup>2</sup>, AND RICHARD GOYER<sup>1</sup>.** <sup>1</sup>Dept. of Entomology, Louisiana State University, Baton Rouge, LA70803 and <sup>2</sup>Dept. of Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 – The interactive effects of herbivory, salinity, flooding, and nutrients on baldcypress (*Taxodium distichum*) and tupelogum (*Nyssa aquatica*).
- 11:45 137 **PEOPLES, SETH AND J.K. SHULL.** Department of Biology, Appalachian State University, Boone, NC 28608 – Female mating preference in a *Drosophila melanogaster* stock that is mutant for sepia (se) eyes.

### Ichthyology 1 – Cypress

- 8:30 138 **PHILLIPS, BRYAN W. AND CAROL E. JOHNSTON.** Dept. Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849 – Faunal changes in a Southeastern stream: effects of land-use and habitat fragmentation.
- 8:45 139 **STRANGE, REX M.<sup>1</sup>, AND RICHARD L. MAYDEN<sup>2</sup>.** <sup>1</sup>Dept. of Biology, Southeast Missouri State University, Cape Girardeau, MO and <sup>2</sup>Dept. of Biological Sciences, Biodiversity and Systematics, The University of Alabama, Tuscaloosa, AL 35487-0344 – Phylogenetic relationships among North American *Phoxinus* species (Teleostei: Cyprinidae) as inferred from mitochondrial cytochrome b sequences: taxonomic and biogeographic considerations.
- 9:00 140 **HERRINGTON, STEVEN J. AND CAROL E. JOHNSTON.** Dept. of Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849 – Differences in fish community structure within a Southeastern stream system: effects of land use.

- 9:15 141 **SCHWARTZ, F. J.** Institute of Marine Sciences, University of North Carolina, Morehead City, NC 28557-3209 – Cytogenetics of elasmobranchs: genome/ phylogenetic implications.
- 9:30 142 **CLEMENTS, MARK D., KYLE R. PILLER, NORMAN MERCADO-SILVA, HENRY L. BART JR., DAVID L. HURLEY.** Tulane University Museum of Natural History, Belle Chasse, LA 70037 – Molecular variation within *Scartomyzon* (Teleostomi: Catostomidae): A preliminary study
- 9:45 143 **PILLER, KYLE R.** Tulane University Museum of Natural History, Belle Chasse, LA 70037 – Ecomorphological variation within the *Etheostoma blennioides* complex (Teleostomi:Percidae)
- 10:00 144 **NEELY, DAVID A.** The University of Alabama, Tuscaloosa, AL 35487-0345 – Morphological and molecular analysis of the Mobile Basin banded sculpin (*Cottus carolinae*) complex.
- 10:15 **BREAK**
- 10:30 145 **LANG, NICHOLAS J.<sup>1</sup> AND LAWRENCE M. PAGE<sup>2</sup>.** <sup>1</sup>Department of Biology, University of Alabama, Tuscaloosa, AL 35487 and <sup>2</sup> Illinois Natural History Survey, Champaign, IL 61820 – Variation of the Longear Sunfish (*Lepomis megalotis*) in Illinois (Osteichthyes: Centrarchidae).
- 10:45 146 **POWERS, STEVEN L. AND RICHARD L. MAYDEN.** Department of Biological Sciences, University of Alabama, Tuscaloosa, AL 35487 – Meristic and morphometric differences of disjunct populations of *Etheostoma baileyi* (Percidae: Ulocentra)
- 11:00 147 **SKELTON, CHRISTOPHER E.<sup>1</sup>, GERALD R. DINKINS<sup>2</sup>, AND BYRON J. FREEMAN<sup>3</sup>.** <sup>1</sup>GA Dept. Nat. Res., Georgia Natural Heritage Program, Social Circle, GA, 30025. <sup>2</sup>Dinkins Biological Consulting, Powell, TN 37849, <sup>3</sup>University of Georgia, Institute of Ecology, Athens, GA 30602 – Systematics of the *Hybopsis winchelli* species complex.
- 11:15 148 **GEORGE, ANNA L. AND RICHARD L. MAYDEN.** Dept. of Biological Sciences, University of Alabama, Tuscaloosa, AL 35487 – Contested language in the Endangered Species Act: The importance of species concepts.
- 11:30 149 **JOY, J. E. AND J. A. BRADBURY.** Dept. of Biological Sciences, Marshall University, Huntington, WV 25755 – Endohelminths of basses in river and reservoir ecosystems of West Virginia.
- 11:45 150 **FLEER, KATRYNA A. AND JAMES E. JOY.** Dept. of Biological Sciences, Marshall University, Huntington, WV 25755 – Monogenetic trematodes (Mazocraeoidae) from gizzard shad in West Virginia.

## THURSDAY AFTERNOON PAPER SESSIONS

### Aquatic Ecology 1 – Audubon E

- 1:30 151 **STANTON, GEORGE E. <sup>1</sup>, AND PAMELA T. LOPEZ<sup>2</sup>.** <sup>1</sup>Dept. of Biology, Columbus State University, Columbus, GA 31907 and <sup>2</sup>Biology Dept., Pacific University, Forest Grove, OR 97116 – Georgia Distributions & Habitat Characteristics of *Procambarus (Ortmannicus) acutissimus* and *P. (O.) verrucosus*.
- 1:45 152 **BATTAGLIA, L. L.<sup>1</sup> AND B. S. COLLINS<sup>2</sup>** <sup>1</sup>Dept. Biological Sciences, Louisiana State University, Baton Rouge, LA 70803 and <sup>2</sup>Savannah River Ecology Laboratory, University of Georgia, Aiken, SC 29802 – Linking patterns: hydroperiod and vegetation in Carolina Bay wetlands.
- 2:00 153 **SAUTERER, ROGER., CORRINE MULLIGAN, AND JAMES RAYBURN.** Department of Biology, Jacksonville State University, Jacksonville, AL 36265 – Research plan and preliminary analysis of water and sediment extracts from Choccolocco Creek, AL, by the FETAX developmental toxicity assay.
- 2:15 154 **REAVES, JARED W.** Naval Research Lab 4555 Overlook Ave, SW Washington DC 20375-5320 – The Examination of Solid Phase Extraction Matrices for the Removal and Concentration of TNT in Seawater.
- 2:30 155 **CLINE, GEORGE R. AND FRANK A. ROMANO, III,** Biology Dept., Jacksonville State University, Jacksonville, AL, 36265-1602 – Response characteristics of the Shannon-Weiner diversity index.
- 2:45 156 **BEECH, CAROLYN D. AND STEPHEN C. LANDERS.** Department of Biological and Environmental Sciences, Troy State University, Troy, Alabama 36082 – Seasonal fluctuations of sessile ciliated protozoa from Dauphin Island, AL.
- 3:00 157 **PARSONS, A. CAROL, JONATHAN M. WILLIS, and GARY P. SHAFFER.** Department of Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 – Findings of the feasibility study of a freshwater diversion into the Lake Maurepas swamp in Southeastern Louisiana – Part II: Herbaceous vegetation.
- 3:15 **BREAK**
- 3:30 158 **HANEY, D.C.<sup>1</sup>, A. MITCHUM<sup>1</sup>, W.B. WORTHEN<sup>1</sup>, C.B. ANDERSEN<sup>2</sup>, AND J. WHEELER<sup>3</sup>.** <sup>1</sup>Biology Dept., <sup>2</sup>Earth and Environmental Sciences Dept., and <sup>3</sup>Chemistry Dept., Furman University, Greenville, SC 29613 – Effects of land use on fish diversity and abundance in the Enoree River, SC.



- 3:45 159 **WALTERS, DAVID M.<sup>1</sup>, MARY C. FREEMAN<sup>1</sup>, DAVID S. LEIGH<sup>2</sup>, BYRON J. FREEMAN<sup>1</sup>, MICHAEL J. PAUL<sup>1</sup>, AND CATHERINE M. PRINGLE<sup>1</sup>.** <sup>1</sup>Institute of Ecology and <sup>2</sup>Department of Geography, University of Georgia, Athens, GA 30602 – Geomorphology, land cover, and water quality as indicators of fish biotic integrity in the Etowah River system.
- 4:00 160 **KNAPP, N.<sup>1</sup> AND B. LAPOINTE<sup>2</sup>.** <sup>1</sup>Dept. of Biology, Furman University, Greenville, SC 29613 and <sup>2</sup>Harbor Branch Oceanographic Institution, Fort Pierce, FL 34946 – Nutrient enrichment, macroalgal biomass, and sea urchin density on the Sabellariid worm reefs along a latitudinal gradient in Southeast Florida.
- 4:15 161 **BARNETT, KIRK G., MICHAEL L. LITTLE, AND DONALD C. TARTER,** Department of Biological Sciences, Marshall University, Huntington, WV 25755 – Analyses of mtDNA and morphometrics of *Gambusia* sp (Pisces: Poeciliidae) in the Green Bottom Wildlife Management Area, West Virginia.
- 4:30 162 **BLAKE, JAMIE<sup>1</sup>, THOMAS JONES<sup>2</sup>, JOHN ENZ<sup>3</sup>, AND DONALD TARTER<sup>1</sup>.** <sup>1</sup>Department of Biological Sciences, Marshall University, Huntington, WV, <sup>2</sup>Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV and <sup>3</sup>Department of Biology, Alderson-Broaddus College, Philippi, WV – The benthic communities found downstream from valley fills in southern West Virginia.
- 4:45 163 **DOLIN, ROBIN E. AND DONALD C. TARTER.** Department of Biological Sciences, Marshall University, Huntington, WV 25755 – Preliminary observations on the natural succession of benthic populations in constructed sediment ponds in southwestern West Virginia.

## Plant Ecology 2 – Audubon A&B

- 1:30 164 **RAYNER, DOUGLAS A.** Wofford College, Spartaburg, SC 29306 – Where have all the wildflowers gone? Effects of deer browse on spring wildflowers in Croft State Park, South Carolina.
- 1:45 165 **BEYERL, TAMMIE R. and DAVID J. GIBSON.** Department of Plant Biology, Southern Illinois University, Carbondale, IL 62901-6509 – Habitat and life history characteristics of *Dioscorea oppositifolia* L., an invasive exotic plant species in southern Illinois.
- 2:00 166 **CHANDY, SHIBI<sup>1</sup> AND DAVID. L.EULER<sup>2</sup>;** <sup>1</sup>Department of Plant Biology, Southern Illinois University at Carbondale Illinois 62901 USA. and <sup>2</sup>Faculty of Forestry, Lakehead University, Thunder Bay, Ontario P7B 5E1 Canada – Impact of silviculture on four medicinal plants in Northwestern Ontario.

- 2:15 167 **SOUZA, LARA<sup>1</sup>, ART H. CHAPPELKA<sup>2</sup>, AND HOWARD S. NEUFELD<sup>1</sup>.** <sup>1</sup>Department of Biology, Appalachian State University, Boone, NC 28608 and <sup>2</sup>School of Forestry, Auburn University, Auburn, AL 36849-5418 – Seasonal development of ozone-induced foliar injury in tall milkweed (*Asclepias exaltata*).
- 2:30 168 **LUKEN, JAMES O. AND PHILLIP W. VALENTINE.** Dept. of Biological Sciences, Northern Kentucky University, Highland Heights, KY 41099 – Inundation frequency and development of forest communities adjacent to flood-control reservoirs.
- 2:45 169 **BENNETT, HOLLY H., ALVIN R. DIAMOND, AND MICHAEL WOODS.** Department of Biological and Environmental Sciences, Troy State University, Troy, AL 36082 – Insect visitors to *Warea sessilifolia* Nash.
- 3:00 170 **Walker, G. L.<sup>1</sup>, D. W. Larson<sup>2</sup>, U. Matthes<sup>2</sup>, and K. Graham<sup>1</sup>.** <sup>1</sup>Dept. of Biology, Appalachian State University, Boone, NC 28608 and <sup>2</sup>Dept. of Botany, The University of Guelph, Guelph, Ontario, Canada, N1G 2W1 – The occurrence of ancient forests on cliffs, regionally and globally.
- 3:15 **BREAK**
- 3:30 171 **GALBRAITH, SHANNON L. AND WILLIAM H. MARTIN.** Division of Natural Areas, Eastern Kentucky University, Richmond, KY 40475 – Three decades of change in an old-growth forest, Lilley Cornett Woods, Kentucky.
- 3:45 172 **WELTZIN, JAKE F.<sup>1</sup> AND RICHARD J. NORBY<sup>2</sup>.** <sup>1</sup>Dept. Ecology and Evolutionary Biology, University of Tennessee, Knoxville, TN 37996 and <sup>2</sup>Oak Ridge National Laboratory, Oak Ridge, TN 37831 – Global change and biological invasions: response of understory invasive plants to elevated CO<sup>2</sup>.
- 4:00 173 **SELLARS, JON D., AND CLAUDIA L. JOLLS.** Department of Biology, East Carolina University, Greenville, NC 27858 – Critical knowledge for the restoration of seabeach amaranth, *Amaranthus pumilus*.
- 4:15 174 **ZETTLER, LAWRENCE. W., ERIN L. MAXWELL, AND SCOTT L. STEWART.** Department of Biology, The Illinois College, Jacksonville, IL 62650 – Do herbarium specimens harbor viable orchid seeds and mycorrhizal fungi for use in conservation?
- 4:30 175 **STEWART, SCOTT L.<sup>1</sup>, LAWRENCE W. ZETTLER<sup>1,2</sup>, MARLIN L. BOWLES<sup>2</sup> AND KAREL A. JACOBS<sup>2</sup>.** <sup>1</sup>Department of Biology, The Illinois College, Jacksonville, IL 62650, <sup>2</sup>The Morton Arboretum, Lisle, IL 60532 – Symbiotic seed germination and mycorrhizal fungi of a Federally-threatened orchid, *Platanthera leucophaea* (Nuttall) Lindley.

- 4:45 176 **SHARMA, JYOTSNA<sup>1</sup>, L. W. ZETTLER<sup>2</sup>, J. VANSAMBEEK<sup>3</sup>, AND C. J. STARBUCK<sup>1</sup>.** <sup>1</sup>Department of Horticulture, University of Missouri, Columbia, MO 65211, <sup>2</sup>Department of Biology, The Illinois College, Jacksonville, IL 62650, <sup>3</sup>North Central Research Station, USDA Forest Service, University of Missouri, Columbia, MO 65211 – Symbiotic seed germination in vitro of Federally-threatened *Platanthera praeclara* Sheviak and Bowles (Orchidaceae).

## Plant Systematics 2 – Mimosa

- 1:30 177 **ROBERTS, ROLAND P. AND LOWELL URBATSCH.** Dept. of Biological Sciences, Louisiana State University. Baton Rouge, LA 70803 – Phylogenetic investigations of the *Ericameria-Chrysothamnus* complex (Astereae, Asteraceae) based on nuclear ribosomal ITS and ETS sequence data.
- 1:45 178 **BRAY, REBECCA D. AND LYTTON JOHN MUSSELMAN.** Department of Biological Sciences, Old Dominion University, Norfolk, Virginia 23529-0266 – Quillworts of Virginia Revisited–Botanical discovery or taxonomic inflation?
- 2:00 179 **WILLIAMS, CHARLIE.** Public Library of Charlotte and Mecklenburg County, Charlotte, NC 28202 – Rediscovery of André Michaux's *Magnolia macrophylla* stations in North Carolina.
- 2:15 180 **JONES, RONALD L.** Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475 – The Andean Highlands of Ecuador--Notes on the Flora and Vegetation.
- 2:30 181 **JONES, RONALD L.** Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475 – The Galápagos Islands--Notes on the Flora and Vegetation.
- 2:45 182 **URBATSCH, LOWELL<sup>1</sup>, PATRICIA COX<sup>2</sup>, AND RICHARD RUTH<sup>1</sup>.** <sup>1</sup>Louisiana State University, Baton Rouge and <sup>2</sup>University of Tennessee, Knoxville 37996-1100 – Is the central Florida endemic *Rudbeckia heterophylla* of “ancient” hybrid origin?
- 3:00 183 **MORETZ, C. CRAIG AND KATHLEEN A. KRON.** Wake Forest University, Winston-Salem, NC 27109 – A phylogenetic study of *Elliottia* using molecular data from the nuclear ribosomal ITS region and chloroplast DNA genes: matK and rbcL.
- 3:15 **BREAK**
- 3:30 184 **HILL, STEVEN R.** Illinois Natural History Survey, Champaign, IL 61820 – The status of *Malvastrum hispidum* (Pursh) Hochr. (Malvaceae) in Illinois.

- 3:45 185 **MICKLE, JAMES E.<sup>1</sup> AND MARIA ROSARIA BARONE LUMAGA<sup>2</sup>.**  
<sup>1</sup>Dept. Botany, North Carolina State University, Raleigh, NC 27695  
 and <sup>2</sup>Orto Botanico, Università di Napoli, 80139 Napoli, Italy –  
 Micromorphology of lycopod cuticles.
- 4:00 186 **FLEMING, CHRIS A.** University of Tennessee, Knoxville, TN 37996-  
 1100 – Ethnobotany: rediscovering humanity's dependence on plants.
- 4:15 187 **MICKLE, JAMES E.** North Carolina State University, Raleigh, NC  
 27695 – Micromorphology of cycad cuticles.

## Herpetology – Magnolia

- 1:30 188 **HURLBURT, GRANT R.** Biological Sciences, Marshall University,  
 Huntington, WV 25702 – Maximum and relative brain mass in a size  
 series of the American Alligator, *Alligator mississippiensis*.
- 1:45 189 **BLACKWELL, ERIC A.<sup>1</sup>, ROBERT A. ANGUS<sup>1</sup>, KEN R. MARION<sup>1</sup>,  
 AND GEORGE R. CLINE<sup>2</sup>.** <sup>1</sup>The University of Alabama at Birmingham  
 and <sup>2</sup>Jacksonville State University – Growth of the spotted salamander  
 (*Ambystoma maculatum*) in east-central Alabama.
- 2:00 190 **DAVIS, AUBREY E. JR., AND GEORGE R. CLINE,** Biology Dept.,  
 Jacksonville State University, Jacksonville, AL, 36265-1602 – Survey  
 of green salamanders (*Aneides aeneus*) in northern Alabama.
- 2:15 191 **LINDSAY, SHANE E. AND DORCAS, MICHAEL E.** Davidson  
 College, Davidson, NC 28036 – Demography and habitat associations  
 of pond dwelling turtles in the western piedmont of North Carolina.
- 2:30 192 **SWENSON, KIRBY C., AND GEORGE R. CLINE,** Biology Dept.,  
 Jacksonville State University, Jacksonville, AL, 36265-1602 –  
 Responses of three salamander species to varying wavelengths of  
 light.
- 2:45 193 **WOOTEN, JESSICA A. AND THOMAS K. PAULEY** Marshall  
 University, Department of Biological Sciences, Huntington, WV 25755  
 – Distribution and morphological differences of *Desmognathus* in West  
 Virginia.
- 3:00 194 **TATUM, TATIANA C., GEORGE CLINE, MARK MEADE, CHARLES  
 OLANDER, AND ROGER SAUTERER.** Department of Biology,  
 Jacksonville State University, Jacksonville, AL 36265 – Observation of  
 metabolic enzymes in two species of anurans.
- 3:15 **BREAK**
- 3:30 195 **MAKOWSKY, ROBERT AND LAWRENCE A. WILSON.** Emory  
 University, Atlanta, GA 30322 and Fernbank Science Center, Atlanta,  
 GA 30307 – Diet of *Cryptobranchus alleganiensis* in the Southern  
 Appalachians.

- 3:45 196 **FELIX, ZACHARY I., AND T. K. PAULEY.** Marshall University, Huntington, WV 25755 – Seasonal, ontogenetic, and diel variation in microhabitat use in three *Desmognathus salamanders*.
- 4:00 197 **SWART, CHARLES C.** Department of Biology, University of Louisiana at Lafayette, Lafayette, Louisiana 70504 – Tadpoles versus predaceous water bugs, background matching leads to predator advantage.
- 4:15 198 **PELLOS, REY A., CLINTON E. MILLER, AND MICHAEL K. MOORE.** Department of Biology, Mercer University, Macon, GA 31207 – Habitat associations of larval anurans and their predators along an environmental gradient.
- 4:30 199 **HANNA, AFIF A. AND JAMES E. JOY.** Dept. of Biological Sciences, Marshall University, Huntington, WV 25755 – *Oswaldocruzia pipiens* (Nematoda) infections in the American toad, *Bufo a. americana* from southwestern West Virginia.
- 4:45 200 **LEONARD, NORMAN E.** University of New Orleans, New Orleans, LA 70148 – Response of a tailed frog (*Ascaphus truei*) population to upstream logging.

## Ichthyology 2 – Cypress

- 1:30 201 **STRANGE, REX MEADE.** Department of Biology, Southeast Missouri State University, Cape Girardeau, MO 63701 – Variation in fin ornamentation among egg-mimic darters (*Catnotus: Etheostoma squamiceps* species complex).
- 1:45 202 **SCHULTZ, DAVID L., MATTHEW POIRIER, AND ALAINA OWENS.** Nicholls State University – Latitudinal variation in the life history of the western mosquitofish (*Gambusia affinis*).
- 2:00 203 **DARDEN, TANYA<sup>1</sup>, KENNETH STUCK<sup>2</sup>, WALTER GRATER<sup>2</sup> AND BRIAN KREISER<sup>1</sup>.** <sup>1</sup>Department of Biological Sciences, University of Southern Mississippi, Hattiesburg, MS 39406 and <sup>2</sup>Gulf Coast Research Lab, University of Southern Mississippi, Ocean Springs, MS 39564 – Evolutionary processes in dystrophic blackwater habitats: speciation and historic biogeography in Enneacanthini sunfishes.
- 2:15 204 **WILSON, JUSTIN S., JEREMY C. MARTIN AND GEORGE R. CLINE,** Biology Dept., Jacksonville State University, Jacksonville, AL, 36265-1602 – Preliminary analysis of the diet of the inshore lizardfish (*Synodus foetens*) from the Mobile Bay area.

- 2:30 205 **EWING, JOHN A., III<sup>1</sup>, STEPHEN T. ROSS<sup>1</sup>, STEPHEN WEEKS<sup>2</sup>.** <sup>1</sup>Dept. of Biological Sciences, University of Southern Mississippi, Hattiesburg, MS 39401 and <sup>2</sup>Dept. of Biology, University of Akron, Akron, OH 44325 – Morphological characteristics of unisexual and bisexual silversides (*Menidia*) collected from brackish water pools on Horn Island, Mississippi.
- 2:45 206 **REINERT, THOMAS R. AND KIMBERLY A. WINTER.** D.B. Warnell School of Forest Resources, University of Georgia, Athens, GA, 30602-2152 – Age structure and management of pacú (*Colossoma macropomum*) in the northeastern Bolivian Amazon.
- 3:00 207 **BILLINGTON, NEIL<sup>1</sup>, AND MICHAEL J. MACEINA<sup>2</sup>.** <sup>1</sup>Dept. Biological Sciences, Troy State University, Troy, AL 36082 and <sup>2</sup>Dept. Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849 – Conservation options for the rare and genetically distinct southern walleye in the Mobile drainage basin.
- 3:15 **BREAK**
- 3:30 208 **DOOSEY, MICHAEL H.** Dept. Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN 37996 – Historical and Current Distribution of Fishes of the Little Pigeon River (French Broad/Tennessee R. drainage).
- 3:45 209 **RADZIO, THOMAS. A.<sup>1</sup>, HERBERT M. AUSTIN<sup>2</sup>, DONALD M. SEAVER<sup>2</sup>, AND TIMOTHY W. STEWART<sup>1</sup>.** <sup>1</sup>Dept. Natural Science, Longwood College, Farmville, VA 23909 and <sup>2</sup>Fisheries Dept., Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, VA 23062-1346 – Summer feeding habits of juvenile striped bass, *Morone saxatilis*, in the James River, Virginia.
- 4:00 210 **ROSS, STEPHEN T.<sup>1</sup>, RYAN J. HEISE<sup>1</sup>, WILLIAM T. SLACK<sup>2</sup>, JOHN A EWING, III,<sup>1</sup> MARK DUGO<sup>1</sup>, AND MOLLIE F. CASHNER<sup>1</sup>.** <sup>1</sup>Dept. Biological Sciences, University of Southern Mississippi, Hattiesburg, MS 39406-5018 and <sup>2</sup>Mississippi Department of Wildlife, Fisheries and Parks, Mississippi Museum of Natural Science, Research and Collections Program, 2148 Riverside Drive, Jackson, MS 39202-1353 – Timing of Seaward Movement and Coastal Habitat Use of Gulf Sturgeon from the Pascagoula River, Mississippi
- 4:15 **GRADY, JAMES M., JAMES S ROGERS, AND ROBERT C CASHNER.** Dept. of Biological Sciences, University of New Orleans, New Orleans, LA 70148 – Allozyme and mtDNA tests of banded topminnow (*Fundulus*) species hypotheses.
- 5:00-5:30 Southeastern ASIH Meeting
- 5:30-6:00 Southeastern Fishes Council Meeting

## FRIDAY, APRIL 6, 2001

### FRIDAY MORNING PAPER SESSIONS

#### Aquatic Ecology 2 – Audubon E

- 8:30 211 **LOWMAN, BENJAMIN<sup>2</sup>, ERICH EMERY<sup>1</sup> AND DONALD TARTER<sup>2</sup>.** <sup>1</sup>Ohio River Valley Water Sanitation Commission (ORSANCO), Cincinnati, OH and <sup>2</sup>Department of Biological Sciences, Marshall University, Huntington, WV 25755 – Changes among Ohio River fish populations due to habitat conditions created by water quality improvement and high-lift dams.
- 8:45 212 **TOMASEK, TERRY M. AND DONALD C. TARTER.** Department of Biological Science, Marshall University, Huntington, WV 25755 – Site specific impact study on the effects of contour seam mining and valley fill construction to the benthic macroinvertebrate community and water chemistry.
- 9:00 213 **FRANKLIN, SCOTT B.<sup>1</sup>, JOHN A. KUPFER<sup>2</sup>, REZA PEZESHKI<sup>1</sup>, AND NATASJA VAN GESTEL<sup>3</sup>.** <sup>1</sup>Dept. of Biology, University of Memphis, Memphis TN 38152, <sup>2</sup>Dept. of Geography and Regional Development, University of Arizona, Tucson, AZ 85721 and <sup>3</sup>Institute of Ecosystem Studies, Millbrook, New York 12545 – Channelization effects on floodplain nutrient pools in western Tennessee.
- 9:15 214 **LOWRANCE, ANDREA<sup>1</sup>, GARY WEIN<sup>2</sup> AND REBECCA SHARITZ<sup>1,2</sup>.** <sup>1</sup>Department of Botany, University of Georgia, Athens, GA 30602 and <sup>2</sup>Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29802 – Shoreline wetlands creation: A trajectory for success.
- 9:30 215 **YOUNG, JAMES A. J. AND FRANK A. ROMANO, III.** Department of Biology, Jacksonville State University, Jacksonville, AL 36265 – A preliminary analysis of a marine meiofauna survey from Dauphin Island, AL.
- 9:45 216 **FAULKNER, BRIAN D. <sup>1</sup>, WILLIAM C. BOWEN<sup>1</sup>, DAN A. CINCOTTA<sup>2</sup>, KIRK G. BARNETT<sup>1</sup> AND DONALD C. TARTER<sup>1</sup>.** <sup>1</sup>Department of Biological Sciences, Marshall University, Huntington, WV 25755, <sup>2</sup>West Virginia Department of Natural Resources, Elkins, WV 26241 – A baseline genetic study of the *Clinostomus funduloides* and the *Clinostomus elongatus*, in West Virginia.
- 10:00 217 **DARDEN, RICHARD<sup>1</sup>, KENNETH STUCK<sup>2</sup>, WALTER GRATER<sup>2</sup>, PATRICIA BIESIOT<sup>1</sup> AND BRIAN KREISER<sup>1</sup>.** <sup>1</sup>Department of Biological Sciences, University of Southern Mississippi, Hattiesburg, MS 39406 and <sup>2</sup>Gulf Coast Research Lab, University of Southern Mississippi, Ocean Springs, MS 39564 – Molecular Method To Distinguish Larval *Callinectes sapidus* And *C. similis* from Non-Indigenous *C. bocourti* (Crustacea:Decapoda:Portunidae)



10:15      **BREAK**

- 10:30    218    **SIRNA, CYNTHIA AND SAFAA AL-HAMDANI.** Jacksonville State University, Jacksonville, AL, 36265 – Potential role of *Salvinia* in remediation of nitrogen and phosphorous from a eutrophic habitat.
- 10:45    219    **MOLAVI, MEHDI, AND JACK W. GRUBAUGH.** Dept. of Biology, University of Memphis, Memphis, TN 38152 – The influence of river modification on sedimentation and leaf litter decomposition rates in river floodplain systems of the lower Mississippi Alluvial Valley.
- 11:00    220    **DE STEVEN, DIANE<sup>1</sup>, CHRISTOPHER BARTON<sup>1</sup>, JULIAN SINGER<sup>1</sup> AND REBECCA SHARITZ<sup>2</sup>.** <sup>1</sup>USDA Forest Service, Center for Forested Wetlands Research, Charleston, SC 29414 and <sup>2</sup>Savannah River Ecology Lab, Aiken SC 29802 – A large-scale experiment for restoration of depression wetlands in South Carolina.
- 11:15    221    **FIKES, L.<sup>1</sup>, J. PORTERFIELD<sup>2</sup>, AND C. HELPS<sup>3</sup>.** <sup>1</sup>Hendrix College, Conway AR 72032, <sup>2</sup>Centre College, Danville, KY 40422, and <sup>3</sup>Biology Dept., Furman University, Greenville, SC 29613 – Microhabitat use by stream fish and anthropogenic effects in the Enoree River basin, SC.
- 11:30    222    **HAMILTON, ROBERT IV, PETER S. KOURTEV, AND JOAN G. EHRENFELD.** Dept. of Ecology, Evolution, and Natural Resources, Rutgers University, New Brunswick, NJ 08901 – Effects of water quality and habitat modification on benthic macroinvertebrates in urban forested wetlands in northeastern New Jersey.
- 11:45    223    **BONE-STRICKLAND, SAMANTHA<sup>1&2</sup>, TERRY RICHARDSON<sup>2</sup> AND FRANK ROMANO<sup>1</sup>.** <sup>1</sup>Jacksonville State University, Jacksonville, AL 36265 and <sup>2</sup>University of North Alabama, Florence, AL 35630 – Energy budgets of aestivating and non-aestivating populations of a freshwater prosobranch snail.

### **Plant Ecology 3 – Audubon A & B**

- 8:30    224    **HUDGENS, HILLARY A., SCOTT L. STEWART, AND LAWRENCE W. ZETTLER.** Department of Biology, The Illinois College, Jacksonville, IL 62650 – Symbiotic germination of the rein orchids (*Habenaria repens*, *H. quinquiseta*, *H. macroceratitis*) and a description of orchid mycorrhizal fungi from Florida.
- 8:45    225    **MINSO, JAGILA<sup>1</sup>, SCOTT L. STEWART<sup>1</sup>, LAWRENCE W. ZETTLER<sup>1</sup>, AND PAUL MARTIN BROWN<sup>2</sup>.** <sup>1</sup>Department of Biology, The Illinois College, Jacksonville, IL 62650, <sup>2</sup>Florida Museum of Natural History, University of Florida Herbarium, Gainesville, FL 32611 – Seed propagation and reintroduction of an endangered orchid (*Spiranthes brevilabris* Lindley) from Florida.

- 9:00 226 **AL-HAMDANI, SAFAA, SHANNA MATTINGLY, AND KIRBY SWENSON.** Jacksonville State University, Jacksonville, AL, 36265 – Remote sensing as a tool for plant stress identification.
- 9:15 227 **BURDETTE, SARAH BETH<sup>1</sup>, JEFFREY D. MAY<sup>1</sup>, FRANK S. GILLIAM<sup>1</sup>, AND MARY BETH ADAMS<sup>2</sup>.** <sup>1</sup>Dept. Biological Sciences, Marshall University, Huntington, WV 25701 and <sup>2</sup>USDA Forest Service, Parsons, WV 26287, USA – Interspecific responses of foliar nutrient concentrations to excessive nitrogen deposition.
- 9:30 228 **COLE, PATRICE G.,<sup>1</sup> WELTZIN, JAKE F.,<sup>1</sup> and MICHAEL A. HUSTON.<sup>2</sup>** <sup>1</sup>Dept. of Ecology and Evolutionary Biology, The University of Tennessee, Knoxville, TN 37996 and <sup>2</sup>Oak Ridge National Laboratory, Oak Ridge, TN 37831 – Identifying the habitat characteristics of the non-native, invasive grass, *Microstegium vimineum*.
- 9:45 229 **PHILLIPS, ROSS J.<sup>1</sup>, THOMAS R. WENTWORTH<sup>2</sup>, HEATHER M. CHESHIRE<sup>3</sup>, JOHN FELS, LAURA BUNYAN, MICHAEL SCHAFALE<sup>4</sup>, AND JOHN AMOROSO<sup>4</sup>.** <sup>1</sup>USDA Forest Service, Southern Research Station, Clemson, SC 29634, <sup>2</sup>Department of Botany, North Carolina State University, Raleigh, NC 27695, <sup>3</sup>Center for Earth Observation, North Carolina State University, NC 27695, <sup>4</sup>North Carolina Department of Environment and Natural Resources, Raleigh, NC 28699 – Classification and predictive modeling of plant communities in the Gorges State Park and Gamelands, North Carolina.
- 10:00 230 **LYNCH, KATHLEEN M., JAMES S. FRALISH, AND JAMES J. ZACZEK.** Southern Illinois University, Carbondale, Illinois 62901 – Study of forest community change at Land Between The Lakes, Kentucky and Tennessee.
- 10:15 **BREAK**
- 10:30 231 **KETTLER, KATIE E., STEPHANIE ROBERTS, KENNETH WILSON AND DAVID FRANCKO.** Dept. of Botany, Miami University, Oxford, OH 45056 – Selection for Cold Tolerance Levels in *Sabal palmetto* (Cabbage palm), and *Sabal minor* var. 'Louisiana' (Bluestem palmetto).
- 10:45 232 **JOLLS, CLAUDIA L.<sup>1,2</sup>, ARIELLE COOLEY<sup>2,3</sup> AND JON D. SELLARS<sup>1</sup>.** <sup>1</sup>Department of Biology, East Carolina University, Greenville, NC 27858, <sup>2</sup>University of Michigan Biological Station, Pellston, MI 49769 and <sup>3</sup>Pomona College, Claremont, CA – Germination ecology of seabeach amaranth, *Amarantus pumilus*, in controlled environments.
- 11:00 233 **MOORE, PATRICK T. AND JAMES J. ZACZEK.** Southern Illinois University, Carbondale, IL 62901-4411 – Silvicultural guidelines for the reintroduction of American chestnut in the central hardwood region.

- 11:15 234 VAUGHN, KAREN H., EDUARDO AQUILAR ESPINOZA, SOFIA ARCE FLORES, CHRISTOPHER L. CLARY, AND MARTIN L. CIPOLLINI. Department of Biology, Berry College, Mount Berry, GA 30149 – Status of Longleaf Pine (*Pinus palustris*) on the Berry College campus, and implications for long-term management.
- 11:30 235 FISHEL, D. W., J. J. ZACZEK, J. E. PREECE – Southern Illinois University, Carbondale, Illinois 62901-4411 – Positional influence on ontogenetic maturity of dormant buds in *Quercus bicolor* and *Quercus rubra*.
- 11:45 236 KALINSKY, ROBERT G.<sup>1</sup> AND JOHN GILL<sup>2</sup>. <sup>1</sup>Louisiana State University in Shreveport and <sup>2</sup>City of Shreveport, Shreveport, LA 71115 – Phytoplankton assemblages and taste and odor problems in a municipal water supply.

### Plant Physiology & Teaching – Mimosa

- 8:30 237 LOKUGE, MEEPA A., LU LI, STEPHANIE ROBERTS, KENNETH G. WILSON, AND DAVID A. FRANCKO. Department of Botany, Miami University, Oxford OH 45056 – Optimization of 2,4-D concentration for callus induction in cold hardy palms *Trachycarpus fortunei* and *Sabal palmetto*.
- 8:45 238 BOUTIN, ALISON, KATIE KETTLER, ROBIN LEWIS, STEPHANIE ROBERTS, KENNETH WILSON, AND DAVID FRANCKO. Miami University, OXFORD, OH 45056 – Accelerated Maturation of *Sabal palmetto* and *Trachycarpus fortunei* Palms by Optimizing the Application of Growth Regulators Gibberellins and Auxin.
- 9:00 239 ROBERTS, STEPHANIE M., BRADLEY D. RAETZKE, ROBIN A. LEWIS, KENNETH G. WILSON, AND DAVID A. FRANCKO. Dept. of Botany, Miami University, Oxford, OH 45056 – Using Cold Assays to Determine if Cold, Nonfreezing Pretreatment Increases Cold Tolerance of Bell Pepper (*Capsicum annuum*).
- 9:15 240 LU LI, MEEPA LOKUGE, EVA HAGER, STEPHANIE ROBERTS, KENNETH WILSON AND DAVID FRANCKO. Dept. of Botany, Miami University, Oxford, OH 45056 – Cold-acclimation response and analysis of cold-tolerant genes in *Trachycarpus fortunei* and *Sabal minor*.
- 9:30 241 LEWIS, ROBIN A., STEPHANIE M. ROBERTS, EVA HAGER, KATIE KETTLER, ALISON BOUTIN, KENNETH G. WILSON, AND DAVID A. FRANCKO. Dept. of Botany, Miami University, Oxford, OH 45056 – Second Generation of Ohio Needle Palms (*Rhapidophyllum hystrix*) via Tissue Culture.

- 9:45 242 **WILSON, KENNETH G., MICHELLE WILKERSON, MEEPA LOKUGE, LU LI, STEPHANIE M. ROBERTS, EVA HAGER, KATIE KETTLER, ROBIN LEWIS, ALISON BOUTIN, TODD GORMAN, AND DAVID A. FRANCKO.** Dept. of Botany, Miami University, Oxford, OH 45056 – Clonal Propagation of Palms for Cold Tolerance Testing in the Laboratory and the Field.
- 10:00 243 **RAFAILL, BARBARA L.** Dept. Biological Sciences, Georgetown College, Georgetown, KY 40324 – Using a simple botany experiment to teach statistics.
- 10:15 **BREAK**
- 10:30 244 **CLINE, GEORGE R., AND FRANK A. ROMANO, III,** Biology Dept., Jacksonville State University, Jacksonville, AL, 36265-1602 – Measurement of species diversity and community similarity in ecology laboratories.
- 10:45 245 **WINDELSPECHT, MICHAEL.** Appalachian State University, Boone, NC 28607 – Online testing: What are the issues and is it effective?

### Genetics – Magnolia

- 8:30 246 **HOLMES, Gibran<sup>1</sup> AND BARRY PITTENDRIGH<sup>2</sup>.** <sup>1</sup>Bowie State University, Bowie MD 20715 and <sup>2</sup>Department of Entomology, Purdue University, West Lafayette, IN 47907 – Understanding the molecular basis of xenobiotic resistance in *Drosophila*.
- 8:45 247 **SHACK, ALLEN AND DWAYNE WISE.** Department of Biological Sciences. Mississippi State University, MS 39762 – Cellular changes in feline kidney cells accompanying infection by lentiviruses.
- 9:00 248 **HERRON, BROOKS AND DWAYNE WISE.** Department of Biological Sciences, Mississippi State University, MS 39762 – Alteration of the metaphase checkpoint by a B-chromosome in the grasshopper *Eyprepocnemis plorans*.
- 9:15 249 **XUESONG LI, SUSAN R. BARNUM, LINDA E. WATSON,** Botany Department, Miami University, Oxford, OHIO 45056 – Phylogenetic relationships among eight heterocystous genera in cyanobacteria using 23S rRNA gene sequencing.
- 9:30 250 **LYERLY, BRIAN J. AND MARY U. CONNELL.** Appalachian State University, Boone, NC 28607 – Analysis of cryptochrome and phototropin genes in the marine brown algae *Scytosiphon lomentaria*.
- 9:45 251 **CARIVEAU, MICKAEL J.<sup>1</sup>, XIN H. HU<sup>1</sup>, QIYING FANG<sup>1</sup>, AND GERHARD W. KALMUS<sup>2</sup>.** <sup>1</sup>Dept. Physics and <sup>2</sup>Dept. Biology, East Carolina University, Greenville, NC 27858 – Efficacy of cutaneous pigment removal using a low energy Nd:YAG laser at 1064nm.

- 10:00 252 **SHULL, J. K. AND B. A. HUDSON.** Department of Biology, Appalachian State University, Boone, NC 28608-2027 – Meiotic synchrony in the a diploid and autotetraploid *Omithogalum virens*. (Anthophyta: Hyacinthaceae)
- 10:15 **BREAK**
- 10:30 253 **COGGIN, STEVEN J., AND KEVIN HART.** Department of Biology, Catawba College, Salisbury, NC 21844 – Allometric Scaling of Flagella in Volvocine Algae.
- 10:45 254 **HAGER, EVA, LU LI, STEPHANIE M. ROBERTS, KENNETH G. WILSON, AND DAVID A. FRANCKO..** Department of Botany, Miami University, Oxford, OH 45056 – Isolation and Characterization of Cold-tolerance Genes in Palms (Arecaceae).
- 11:00 255 **IZZO, INGRID, MALCOLM COLBERT, MICHELLE GREENE, AND CHRISTI MAGRATH.** Dept. of Biological and Environmental Sciences, Troy State University, Troy. AL 36082 – The effect of lead of *Saccharomyces cerevisiae*: towards the identification of lead responsive genes.
- 11:15 256 **FRAZIER, LAURI, KIANA BRADLEY, AND CHRISTI MAGRATH.** Dept. of Biological and Environmental Sciences, Troy State University, Troy. AL 36082 – The effect of varying levels of transcriptional interference on replication in *Saccharomyces cerevisiae*.
- 11:30 257 **SHERIDAN, SEAN AND J. KENNETH SHULL, JR.** Department of Biology, Appalachian State University, Boone, NC. 28608 – The use of visual cues in determining mate choice in female *Drosophila melanogaster*.
- 11:45 258 **MAYRHOFER, MARIA, M. P. ROWE AND J. K. SHULL.** Department of Biology, Appalachian State University, Boone, NC 28608-2027 – Sexual selection in certain mutant stocks of *Drosophila melanogaster*.

### Microbiology & Developmental Biology – Cypress

- 8:30 259 **BOOPATHY, RAJ AND RICHARD MARTIN.** Biological Sciences, Nicholls State University, Thibodaux, LA 70310 – Enhanced Biotransformation of Carbon Tetrachloride Under Mixed Electron Acceptor Conditions.
- 8:45 260 **CURTIS, ELISABETH AND LAJOYCE H. DEBRO.** Department of Biology, Jacksonville State University, Jacksonville, AL 36265 – Association of gene sequences with inclusion proteins of *Bacillus thuringiensis* subspecies *finitimus*.

- 9:00 261 **SOMERVILLE, CHARLES<sup>1</sup> AND MICHAEL LABARE<sup>2</sup>.** <sup>1</sup>Marshall University Department of Biological Sciences, Huntington, WV 25755 and <sup>2</sup>The United States Military Academy Department of Chemistry, West Point, NY 10996 – Transformation of nitroaromatic compounds by *Pseudomonas pseudoalcaligenes* JS52.
- 9:15 262 **VAN METER, SAMUEL AND CHARLES SOMERVILLE.** Marshall University Department of Biological Sciences, Huntington, WV 25755 – Antimicrobial activities of bacteria associated with medicinal plants.
- 9:30 263 **LAYNE, GINGER AND CHARLES SOMERVILLE.** Marshall University Department of Biological Sciences, Huntington, WV 25755 – Antimicrobial activities in extracts of Ginkgo, Kudzu, and Clover.
- 9:45 264 **WATKINS, RICHARD M. AND LAJOYCE H. DEBRO.** Department of Biology Jacksonville State University, Jacksonville, AL 36265 – Subcloning a gene for parasporal inclusion protein of *Bacillus thuringiensis subspecies finitimus*.
- 10:00 265 **GASS, CARRIE B AND LEON L. LUNDIE.** Appalachian State University, Boone , NC 28608 – Temporal diversity of bacterial populations during initial colonization of substrate.
- 10:15 **BREAK**
- 10:30 266 **SPRATT, HENRY G., Jr.** Department of Biological and Environmental Sciences, University of Tennessee, Chattanooga, TN 37403 – Comparison of the impact of timber harvest by clear-cutting and selective-harvest on surface soil microbial activity and nutrient cycling.
- 10:45 267 **RAYBURN, JAMES.** Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 – Preliminary background contamination and developmental effects using FETAX from sites around the Anniston Army Chemical Weapons Incinerator.
- 11:00 268 **ALADDIN, RANDA K. AND RAYBURN, JAMES R.** Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 and State University – Toxicity of Phloxine B on the Developing Embryos of *Xenopus laevis*.
- 11:15 269 **HERR, J. M., JR. AND MIHÁLY CZAKÓ.** Dept. of Biological Sciences, University of South Carolina, Columbia, SC 29208 – Wood Structure in *Dalbergia glabra* Standl. and *D. brownei* Schinz.
- 11:30 270 **PENDERGRASS, DARRYL C., GEORGE CLINE AND JAMES R. RAYBURN,** Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 – Comparison of the Effects Nitrogen Compounds on the Development of *Xenopus laevis* and *Pseudacris crucifer*.

## FRIDAY AFTERNOON PAPER SESSIONS

## Plant Ecology 4 – Audubon E

- 2:30 271 POPE, CHAD P.<sup>1</sup>, SCOTT B. FRANKLIN<sup>1</sup>, AND BEVERLY COLLINS<sup>2</sup>. <sup>1</sup>Dept. of Biology, The University of Memphis, Memphis, TN 38152 and <sup>2</sup>Savannah River Ecology Lab, Savannah, GA 29802 – Effects of disturbance frequency and intensity on old field succession.
- 2:45 272 PAULK, ERIC<sup>1</sup>, MARTIN L. CIPOLLINI<sup>1</sup>, AND DONALD F. CIPOLLINI<sup>2</sup>. <sup>1</sup>Department of Biology, Berry College, Mount Berry, GA 30149 and <sup>2</sup>Wright State University, Dayton, Ohio 45435 – Effect of nitrogen and water treatment on leaf chemistry in Horsenettle (*Solanum carolinense*), and relationship to herbivory by flea beetles (*Epitrix* spp.) and Tobacco Hornworm (*Manduca sexta*).
- 3:00 273 DILUSTRO, JOHN, BEVERLY COLLINS, LISA DUNCAN, REBECCA SHARITZ, J. VAUN MCARTHUR, CHRIS ROMANEK AND JOHN SEAMAN. Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29802. – Thresholds of disturbance: Land management effects on vegetation and nitrogen dynamics.
- 3:15 274 HELMS, BRIAN<sup>1</sup>, JOHNNY RANDALL<sup>1</sup>, and ALÄA WALLY<sup>2</sup>. <sup>1</sup>North Carolina Botanical Garden, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599 and <sup>2</sup>Archbold Biological Station, Lake Placid, FL, 33862 – Does fire management affect the vegetation structure of a remnant diabase glade community in Durham, NC?
- 3:30 275 ALLEN, BRUCE P., and REBECCA R. SHARITZ. Savannah River Ecology Laboratory – Forest population dynamics in seven southeastern floodplain forests.
- 3:45 276 LEWIS, MARK J., L. M. BOWE AND D. L. SHUMWAY. Dept of Biological Sciences, Frostburg State University, Frostburg, MD 21532 – Effects of the canopy opening on the understory of an old growth eastern hemlock-northern hardwood forest in south-central Pennsylvania.
- 4:00 277 KUPPINGER, DANE, AND JAKE WELTZIN, University of North Carolina-Chapel Hill AND University of Tennessee-Knoxville – The state of alien invasive plant knowledge and control on managed lands of the southern appalachians.
- 4:15 278 BROOKS, JANIE S. Dept. Ecology and Evolutionary Biology, Cornell University, Ithaca, NY 14853 and Div. Environmental Studies, Mathematics, and Natural Sciences, Brevard College, Brevard, NC 28712 – Intraspecific variation in volatile profiles of *Daucus carota* genotypes in response to resource availability.
- 4:30 279 KEELEY, M.T., J. J. ZACZEK, J. E. PREECE - Southern Illinois University, Carbondale, IL 62901-4411 – Variability of sap volume and sugar concentration among silver maple (*Acer saccharinum* L.) trees within upland plantings and riparian zone forests.



**Herbarium Symposium – Mimosa**

- 1:30 280 **MURRELL, ZACK E.** Department of Biology, Appalachian State University, Boone, NC 28608 – Planning for the future: herbaria in the 21st century.
- 1:45 281 **FUNK, V. A.** Department of Botany, Smithsonian Institution, Washington, D.C. 20560 – The Herbaria of the Southeast United States, an update.
- 2:00 282 **HORN, CHARLES N.** Newberry College, Newberry, SC 29108 – Herbaria at four-year colleges: the balance between teaching and curation.
- 2:15 **BREAK**
- 2:30 283 **JONES, RONALD L.** Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475 – The herbarium at the comprehensive university-promoting the growth, maintenance, and support of these disappearing facilities.
- 2:45 284 **HAYNES, ROBERT R.,** Department of Biological Sciences, The University of Alabama, Tuscaloosa, AL 35487 – Herbaria in research universities.
- 3:00 285 **WHITE, PETER S.** North Carolina Botanical Garden at the University of North Carolina at Chapel Hill, Chapel Hill, NC 27599 – Herbaria in botanical gardens.
- 3:15 **BREAK**
- 3:30 - 4:30 **SYMPOSIUM DISCUSSION**
- 4:30 - 5:30 **Herbarium Curators meeting**

**Aquatic Ecology 3 – Magnolia**

- 1:30 286 **FISHER, KIMBERLY J. AND MARK W. HESTER.** Dept. of Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 – A mesocosm investigation of floating marsh response to increased salinity and nutrient levels.
- 1:45 287 **HOEPPNER, SUSANNE S., JONATHAN M. WILLIS, AND GARY P. SHAFFER.** Dept. Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 – Preliminary Findings of the Feasibility Study of a Freshwater Diversion Into the Maurepas Swamp - Part I: Primary Productivity of Trees.

- 2:00 288 **SCHAFF, STEVEN D.**<sup>1,2</sup> **S. REZA PEZESHKI**<sup>2</sup>, **AND F. DOUGLAS SHIELDS, JR.**<sup>3</sup>. <sup>1</sup>Institute of Ecology, University of Georgia, Athens, GA 30602, <sup>2</sup>Department of Biology, University of Memphis, Memphis, TN 38152, and <sup>3</sup>National Sedimentation Laboratory, USDA-ARS, MS 38655 — Streambank restoration using willow; a case study of site specific limitations to success.
- 2:15 289 **WALSER, CHRIS A.**<sup>1</sup> **AND HENRY L. BART JR.**<sup>2</sup>. <sup>1</sup>Department of Biology, Albertson College of Idaho, Caldwell, ID 83605 and <sup>2</sup>Tulane University Museum of Natural History, Belle Chasse, LA 70037 — Patterns of interspecific association between bluehead chub (*Nocomis leptcephalus*) and other cyprinids in four river drainages of the southeastern U.S.
- 2:30 290 **PHILLIPS, JERRI AND MARK SCHORR.** Dept. of Biological and Environmental Sciences, University of Tennessee at Chattanooga, Chattanooga, TN 37403 — Effect of urbanization on the biotic integrity of fish assemblages in Black Creek, Chattanooga, Tennessee.
- 2:45 291 **SHOUP, HEIDI R.**<sup>1</sup>, **STUART LUDSIN**<sup>2</sup>, and **ROY A. STEIN**<sup>2</sup>. <sup>1</sup>Dept. of Biological Sciences, University of New Orleans, New Orleans, LA 70148 and <sup>2</sup>Aquatic Ecology Laboratory, Ohio State University, Columbus, OH 43210 — A Quantitative Analysis of Zooplankton Sampling Methods.
- 3:00 292 **NELSON, DIANE R.** Dept. Biological Sciences, East Tennessee State University, Johnson City, TN 37614 — Marine invertebrates of the Solomon Islands and Papua New Guinea.

### Ornithology & Mammalogy – Magnolia

- 3:30 293 **LLEWELLYN, JEFFREY B.** Ecology Program, Brevard College, Brevard, NC 28712 — Early morning and early evening counts of bird species, Beaver Lake Bird Sanctuary, Asheville, NC.
- 3:45 294 **BROWN, DAVID AND JENNIFER LONG.** Ecology and Evolutionary Biology, Tulane University, New Orleans, LA 70118 and Dept. of Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 — The effect of experimental fruit removal on territory structure of wintering Hermit Thrushes.
- 4:00 295 **MURRAY, REBECCA L., TYLER P. STANTON, AND VERL R. EMRICK.** Conservation Management Institute, Virginia Tech College of Natural Resources, Blacksburg, VA 24061 — First described vocal mimicry of Bachman's sparrow (*Aimophila aestivalis*) in the piedmont of southeast Virginia.

- 4:15 296 **NOLFO, LAUREN E.<sup>1</sup> AND CRAIG S. HOOD<sup>2,3</sup>.** <sup>1</sup>Dept. Ecology & Evolutionary Biology, Tulane University, New Orleans, LA 70118, <sup>2</sup>Dept. Biological Sciences, Loyola University, New Orleans, LA 70118, <sup>3</sup>Tulane Museum of Natural History, Belle Chasse, LA 70037 – A 5-year study of microhabitat use and roost preference in the eastern pipistrelle bat, *Pipistrellus subflavus* in Southeastern Louisiana.
- 4:30 297 **BURKE, T.S., M.L. HERRELL, AND M.E. HIGHT.** Department of Biological Sciences, Marshall University, Huntington, WV 25755 – Marshall University Mammal Collection.
- 4:45 310 **RAMSDELL, CLIFTON AND KELLY PRINCE.** University of South Carolina, Columbia, SC 29208 – Comparative Genome Mapping of *Peromyscus maniculatus*.

### Animal Physiology – Cypress

- 1:30 298 **HOGAN, G. RICHARD.** Austin Peay State University, Clarksville, TN 37043 – Selenium-induced hemolysis in mice: An in vitro determination.
- 1:45 299 **COHEN, GLENN M.<sup>1</sup>, ERIC G. SPOKAS<sup>2</sup>, AND PI-SHIANG LAI<sup>2</sup>.** <sup>1</sup>Department of Biological and Environmental Sciences, Troy State University, Troy, AL 36082 and <sup>2</sup>UMDNJ-School of Osteopathic Medicine, Medical Center Drive, Stratford, NJ 08084 – Baseline cytological and Na<sup>+</sup>/K<sup>+</sup>-ATPase activity in the gills of *Fundulus heteroclitus*.
- 2:00 300 **OLANDER, JOSHUA AND MARK MEADE.** Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 – Acute effects of sub-lethal exposure to nitrate, nitrite, and ammonia to juvenile *Palaemonetes* spp.
- 2:15 301 **FENTRESS, JENNIFER A.<sup>1</sup>, THEA HOEXUM BROUWER<sup>2</sup>, MARIUS BROUWER<sup>2</sup>, JOHN A. MCLACHLAN<sup>3</sup>, AND ANN O. CHEEK<sup>1</sup>.** <sup>1</sup>Southeastern Louisiana University, Hammond, <sup>2</sup>University of Southern Mississippi, Ocean Springs, and <sup>3</sup>Tulane University, New Orleans, LA – Examination of a potential environmental anti-estrogen.
- 2:30 302 **LORENZ, OTTO T.<sup>1</sup>, STEVE MILLER<sup>2</sup>, AND ANN CHEEK<sup>1</sup>.** <sup>1</sup>Southeastern Louisiana University, Hammond, LA 70401 and <sup>2</sup>Aquarium of the Americas, New Orleans, LA 70130 – Reproductive physiology and endocrinology of the banded watersnake (*Nerodia fasciata*).
- 2:45 303 **WILSON, MISTI H. AND MARK E. MEADE.** Dept. of Biology, Jacksonville State University, Jacksonville AL 36265 – Effects of sub-lethal exposure to combinations of ammonia, nitrite, and nitrate on aerobic metabolism in juvenile Australian crayfish, *Cherax quadricarinatus*.

- 3:00 304 **GUTHRIE, JOSEPH AND MARK MEADE.** Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 – Effects of sub-lethal exposure to ammonia, nitrite, and nitrate on metabolic rates in juvenile *Oreochromis niloticus*.
- 3:15 **BREAK**
- 3:30 305 **LALLI, PETER N., SYED S. MAHMOOD, AND JAY A. YODER.** Department of Biology, Wittenberg University, Springfield, OH 45501 – Determination of aggregation cues and arthropod source for the Madagascar-hissing cockroach mite, *Gromphadorholaelaps schaeferi*.
- 3:45 306 **MAHMOOD, SYED S. AND JAY A. YODER.** Department of Biology, Wittenberg University, Springfield, OH 45501 – Desiccation-hardiness properties of glycerol and its relation to freeze tolerance in the flesh fly, *Sarcophaga bullata*.
- 4:00 307 **YODER, JAY A., KATHLEEN A. REINSEL, AND JAMES M. WELCH.** Department of Biology, Wittenberg University, Springfield, OH 45501 – Herding behavior promotes water conservation in the sand fiddler crab, *Uca pugilator*.
- 4:15 308 **MORTON, DAVID, JAMES. H. HOWARD, JONATHON D. WINTER, AND KURT M. MUEHLEISEN.** Frostburg State University, Frostburg, MD 21532 – Histopathological screen of serially sectioned amphibian larvae after chronic exposure to chlorpyrifos, carbaryl and imidacloprid.

## BETA BETA BETA BIOLOGICAL SOCIETY SOUTHEASTERN REGION

The following papers are **not listed** in the order in which they will be presented. The schedule for these presentations will appear in the Beta Beta Beta program **available at the meeting**. Additional titles may have been submitted to the final program.

### District I Papers

**BARTHELERY, MIGUEL.** Sigma Psi, Florida Institute of Technology-Signal transduction during fertilization in the sea urchin.

**BUCK, BREE.** Sigma Psi, Florida Institute of Technology-Neural mechanisms of predatory targeting in the diamondback rattlesnake.

**COLE, CHRISTOPHER L. JR.** Tau Eta, Catawba College-Comparing aggression and dominance in two species of songbirds.

**CRAVEN, HEATHER.** Tau Xi, Meredith College-Molecular evolution of the ether-a-gogo gene in *Drosophila melanogaster*.

**FLEEGLE, JACQUELYN.** Tau Xi, Meredith College-Isolation of antibiotic resistant *Acinetobacter spp.* from aquatic environments.

**GOPAL, ARUN.** Beta Rho, Wake Forest University-Efficacy of fecal egg shields in the dogbane beetle (*Chrysochus auratus* L.)

**LIN, YEN-JWU.** Tau Sigma, Gardner-Webb University-Anti-microbial properties of southwestern plants.

**LINDER, SCOTT.** Sigma Psi, Florida Institute of Technology-Flow cytometric analysis of Cyclin B1 expression and DNA synthesis in synchronous immortalized hematopoietic cells.

**MATHENT, WAYNE AND R.D. MCCALL.** Sigma Sigma, University of North Carolina at Wilmington -The angiotensin I-converting enzyme I/D polymorphism in three genotypes of mice.

**NORWOOD, KIMBERLY G. AND D. WILSON FRESHWATER.** Sigma Sigma, University of North Carolina at Wilmington –Chloroplast-encoded 16S rRNA gene sequences: a new tool for phylogenetic studies of red algae?

**O'SHAUGHNESSY, JOE, MARK GAY, AND DICK DILLAMAN.** Sigma Sigma, University of North Carolina at Wilmington-Examination of endocuticle proteins in the juvenile crab, *Callinectes sapidus*.

**PATE, SUSAN.** Sigma Sigma, University of North Carolina at Wilmington-Sodium transport and permeability in juvenile blue crabs.

**WILLIAMS, LYNNE AND LAELA SAYIGH.** Sigma Sigma, University of North Carolina at Wilmington-Analysis of signature whistles of adult female bottlenose dolphins.

### District I Poster Titles

**CASELL, MEGAN.** Tau Xi, Meredith College-High throughput screening for UGT alleles among ethnic groups.

**FARRIS, JASON.** Tau Upsilon, Belmont Abbey College-A study of *Magnolia macrophylla*.

**FURMICK, CHRISTINE.** Tau Xi, Meredith College-Characteristics of homozygous  $\Delta 27$  cells from *Brca2* knockout mice and RACE analysis.

**HALL, MEGHAN.** Sigma Psi, Florida Institute of Technology -A comparison of water chemistry between created and natural wetlands in east central Florida.

**HART, KEVIN.** Tau Eta, Catawba College-Allometric scaling of flagella in volvoclean algae.

**MCGUIRE, AVERY.** Tau Eta, Catawba College-Mathematical models in the rabies epizootic.

**MONTANARO, CHRIS.** Tau Eta, Catawba College-Muscle atrophy in a sexually dimorphic bifunctional muscle of the American cockroach *Periplaneta americana*.

**URBAN, JEANNE.** Sigma Psi, Florida Institute of Technology-Cell synchronization and flow cytometric analysis of Cyclin A expression in a human leukemic cell line.

**ZIOLEK, TRACY.** Sigma Sigma, University of North Carolina at Wilmington-Evidence of luminescent bacteria in sites of Bradley Creek and the taxonomic identification of the bacteria strains.

### District II Paper Titles

**ABRAMS, BRANDON.** Mu Iota, Northern Kentucky University -A southern blot analysis of HT1080 human fibrosarcoma cancer cells, in specific accordance to the stromelysin gene.

**ANDERSON, K.M., M. ZWICK, K.M. ALBERS, AND B.M. DAVIS.** Mu Chi, Midway College-GDNF's role as a target-derived growth factor for nociceptive neurons.

**BAKER, DOUG.** Mu Iota, Northern Kentucky University - The effects of sodium diethyldithiocarbamate on the uptake and acute toxicity of chromium and manganese in zebra mussels (*Dreissena polymorpha*).

**DOCKERY, JEREMY A.** Mu Omicron, Columbus State University-Correlations between allozyme variation in mosquito fish (*Gambusia affinis*) populations and water quality at Oxbow Meadows Environmental Center, Columbus , Georgia (Muscogee County).

**DOWNES, ANDREW.** Pi Delta, East Tennessee State University-Sequence determination of flavanone 3-hydroxylase (F3H) and 7-O-glucosyltransferase (7GT) in *Citrus paradisi*.

**DOWNEY, HEATHER.** Mu Chi, Midway College-Use of antibiotic susceptibility to identify nonpoint source fecal coliforms.

**DUNDAS, BRIAN.** Mu Iota, Northern Kentucky University-Cloning and developmental expression of a putative magnesium transporter in *Dictyostelium discoideum*.

**FOREE, TONYA.** Mu Iota, Northern Kentucky University -Comparative morphology of Sarraceniopus mites from three species of *Sarracenia* pitcher plants.

**HANSEN, ELIZABETH.** Pi Delta, East Tennessee State University -Mutational definition of Visna virus rev protein basic domain.

**IBRAHIM, ESHA.** Pi Delta, East Tennessee State University-Analysis of cell density growth in U937 populations.

**JAEGER, CARRIE.** Mu Iota, Northern Kentucky University -The effects of retinoic acid and TIMPS on the invasiveness of fibrosarcoma.

**KHANNA, RITU.** Pi Delta, East Tennessee State University-Phylogenetic analysis of the psbA gene sequence among major lineages of ferns and fern allies.

**NEW, APRIL.** Pi Delta, East Tennessee State University -The effects of stimulated microgravity on the angiogenesis of the corpus luteum of the golden hamster.

**PHIFER, BONNIE L.** Mu Omicron, Columbus State University-Developmental effects of nitrates on the species *Rana pipiens*.

**ROBERTSON, CANDACE.** Mu Phi, Jacksonville State University-Temporal variation in perch height selection in the spring peeper, *Pseudacris crucifer*.

**WAKEFIELD, CHRISTINA.** Mu Iota, Northern Kentucky University-Karyotype analysis of HT1080 fibrosarcoma cells.

## District II Poster Titles

**BALENTINE, RHIANNON.** Mu Chi, Midway College-Photocytotoxic effects of curcumin on *Staphylococcus aureus* and *Serratia marcescens*.

**MYERS, JAMILA E.** Mu Omicron, Columbus State University-Suitability of environmental conditions in Blue Spring Creek, Harris County, Georgia, for *Salvelinus fontinalis* (brook trout) and *Oncorhynchus mykiss* (rainbow trout).

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ABSTRACTS

1. JOHNSON, JAMES R.<sup>1,2</sup> <sup>1</sup>Zoology Department, North Carolina State University, Raleigh, NC 27609 and <sup>2</sup>Bioinformatics, Paradigm Genetics, Inc., Research Triangle Park, NC 27709-Latitudinal variation in morphometric development of Atlantic croaker, *Micropogonias undulatus*, in Western North Atlantic and Gulf of Mexico estuarine waters.

Morphometric development over the latitudinal range of a nektons distribution may be an indicator of specific phenotypic responses to local environmental conditions. This work examines the variation in morphometric development for the panmictic catadromous Atlantic croaker, *Micropogonias undulatus*, to test the hypothesis that differences may be associated with adaptive responses to seasonal estuarine conditions evident at different latitudes over their range. Ten morphometrics were measured on 3,555 specimens from seasonal samples obtained at nine geographically diverse locations in the Western North Atlantic (31°N:81°W - 39°N:75°W) and Gulf of Mexico (26°N:97°W - 30°N:87°W). Results from multivariate ANOVA and discriminant analysis indicate that size adjusted morphometrics are not statistically different (Wilks' Lambda p=0.394) over latitude sampled providing evidence that supports homogenous development. However, size specific morphometric development rates do follow a statistically significant seasonal gradient (Wilks' Lambda p<0.001) from May to September over their latitudinal range, supporting a time dependent development continuum over the summer growth season. Estimated relative growth was computed at each sampling location to examine differences in latitudinal variation in summer growth rates. Atlantic croaker development rates and estimated relative growth were shown to increase with increasing latitude arriving at similar sizes by the end of the summer growth season in September.

2. CASHNER, MOLLIE F. University of Southern Mississippi, Hattiesburg, MS 39406-Responses of five common freshwater fishes to conspecific skin extract.

Investigations of the alarm systems of fishes began with K. von Frisch's observation that *Phoxinus phoxinus* exhibited a fright reaction when exposed to an injured conspecific. Since this discovery, many species of fishes have been tested for the presence of a species-specific alarm response, but many species remain unstudied. Recent studies reveal that some taxa which previously were thought to not exhibit an alarm response, do respond to conspecific skin

extract with appropriate anti-predator behavior. I tested five common freshwater fishes from Mississippi for their response to conspecific skin extract using water as the control. Three of these species (*Cyprinella venusta*, *Gambusia affinis*, and *Fundulus olivaceus*) have been shown to exhibit fright reactions to conspecific skin extract in previous studies, and two have not been studied (*Pimephales vigilax* and *Lepomis macrochirus*). Other species in the genus *Pimephales* have been shown to exhibit alarm responses; there are conflicting results for the genus *Lepomis*. Preliminary findings show that *C. venusta* and *G. affinis* confirm past research and exhibit a strong fright reaction, while *F. olivaceus* does not. *Pimephales vigilax* also exhibits a strong response. *Lepomis macrochirus* does not show a fear response, but appears to increase foraging behavior.

3. GIBBONS, J. WHITFIELD. University of Georgia's Savannah River Ecology Laboratory, Aiken, SC-Evaluating distribution and abundance patterns of herpetofauna based on five decades of sampling and one million individuals.

Data on distribution and abundance were compiled for more than one million individuals of 100 species of reptiles and amphibians recorded between 1951 and 2000 on the U.S. Department of Energy's Savannah River Site in South Carolina. Analyses reveal that perceptions of herpetofaunal species diversity are strongly dependent on level of effort; hence, land management decisions based on short-term databases for some faunal groups should be viewed with caution. The information available provides a perspective of what might be achieved if long-term, coordinated research efforts were instituted nationwide for faunal groups in which sampling is often sporadic and unpredictable. Widespread cooperation among academic and agency scientists in the dissemination of data on regional patterns of biodiversity could result in meaningful comparisons of status and trends of the biota of the United States.

4. WOOTEN, JESSICA, ARIANA BREISCH AND THOMAS K. PAULEY. Marshall University, Department of Biological Sciences, Huntington, WV 25755 -SEM analysis of tooth morphology in some species of the family Plethodontidae.

We examined tooth morphology of several Plethodontid salamanders with the scanning electron microscope. Species observed included *Plethodon glutinosus*, *P. cinereus*, *Aneides aeneus*, *Desmognathus monticola*, *D. welteri*, *D. quadramaculatus*, *D. fuscus*, and *D. ochrophaeus*. Several morphological characteristics of teeth were observed including quantity, shape, width at base and crown, and height on the upper and lower jaws. Vomerine teeth were compared. *P. glutinosus*, *P. cinereus*, and *A. aeneus* were examined because they occupy the same or similar habitats and they are closely related. Often *P. glutinosus* and *A. aeneus* are sympatric in rock outcrops and food consumed and should result in similar tooth structure. *P. glutinosus* and *P. cinereus* are sympatric in other terrestrial habitats. *Desmognathus* species were used as an out-group to compare more terrestrial species to aquatic species. *Desmognathus* species are unique in that they can be compared from the most aquatic to the most terrestrial within the genus as well as to the other more terrestrial species outside the genus.

5. FELIX, ZACHARY, JESSICA WOOTEN, NANCY J. DICKSON, ROBERT FIORENTINO, ARIANA BREISCH, MIZUKI TAKAHASHI, AND THOMAS K. PAULEY. Department of Biological Sciences, Marshall University, Huntington, WV 25755 -Nontarget Impacts on Terrestrial and Aquatic Salamanders from Insecticide Applications and Gypsy Moth Defoliation.

A long-term study of the effects of a gypsy moth insecticide on terrestrial and aquatic salamanders began in 1995. Effects of *Bacillus thuringiensis* var. *kurstaki* (Bt) (treatment), Gypchek (control), and gypsy moth defoliation (untreated) were compared. Salamander species diversity, abundance, percentage of tail fat and reproductive status of each species were collected on aquatic and terrestrial salamanders in the three treatment plots. Cover

boards, point counts and night surveys were used to measure surface abundance of terrestrial salamanders. Aquatic salamanders were surveyed at night and during the day with refugia bags, rock searches, and larval searches. Comparison between surface abundance among adults and juveniles, reproductive potential and analysis of environmental criteria were used to assess the potential effects of the insecticide treatment. Data from 1999 and 2000 indicate that air temperature and soil temperature on the untreated plots were greater than on both Bt and gypchek plots. Defoliation resulted in an increase in soil temperature, a decrease in soil moisture (in the first 3-5 cm), a decrease in relative humidity on the forest floor, and a decrease in leaf litter.

6. HELPS, C.<sup>1</sup>, L. SPIETH<sup>1</sup>, J. PORTERFIELD<sup>2</sup>, AND D.C. HANEY<sup>1</sup>. <sup>1</sup>Biology Dept., Furman University, Greenville, SC 29613 and <sup>2</sup>Centre College, Danville, KY 40422-A study of body morphology and microhabitat use of several families of freshwater fish in the Enoree River Basin, SC.

The morphological traits of minnows, darters, catfish, and sunfish found in the Enoree River watershed, SC, were compared to the microhabitat use of each family. At each sampling site, subreaches were designated as pools, runs, or riffles and sampled for fish with a backpack electrofisher. Characteristics of each subreach were recorded and fish were either identified and released, or preserved for identification confirmation and vouchering. A Principal Components Analysis (PCA) was performed to see which habitat variables were correlated with the presence of minnows, darters, catfish, and sunfish in a given subreach. Minnows were distributed almost equally in pools, runs, and riffles, while darters were sampled more often in riffles and runs, and sunfish commonly inhabited pools. Catfish did not exhibit a subreach preference. Presence of darters in a subreach was correlated with shallower depths and gravel/cobble substrates, presence of catfish was correlated with woody debris, and minnows occupied the entire multivariate space. Representatives from each family were then selected for the morphological study. Body shape, fin size, and feeding structures, among others, differed in the four groups. While microhabitat usage overlapped in some groups, all had differing morphological traits that aided in their use of the habitat.

7. MITCHUM, A.<sup>1</sup>, D.C. HANEY<sup>1</sup>, W.B. WORTHEN<sup>1</sup>, AND J. PORTERFIELD<sup>2</sup>. <sup>1</sup>Biology Dept., Furman University, Greenville, SC 29613 and <sup>2</sup>Centre College, Danville, KY 40422-Fish distribution in the Enoree River, SC.

The Enoree River is a tributary of the Broad River and drains an 1193 km<sup>2</sup> sixth-order watershed with 170 km of perennial streams. During the summers of 1999 and 2000 we sampled fishes, salamanders, and aquatic invertebrates at over 130 sites in 9 tributary watersheds and along the main channel of the Enoree River. These collections represent the first intensive sampling effort in this system. All sampling was performed with a 4'x10'x1/8" seine, dip nets, and a backpack electrofisher. Fishing time was standardized by collecting for 480 seconds of shocking time at each site. Thirty-eight species of fish from 20 genera and 7 families were collected. Cyprinids (particularly *Notropis lutipinnis* and *Nocomis leptcephalus*) were most abundant, followed by centrarchids (particularly *Lepomis macrochirus* and *L. auritus*), percids (particularly *Etheostoma thalassinum*), ictalurids (particularly *Ameiurus platycephalus*), and catostomids (particularly *Catostomus commersoni* and *Moxostoma (Scartomyzon) rupiscartes*). Although most species collected were previously known to be in the Enoree watershed, several unusual species were collected as well. These include *Lepomis cyanellus*, commonly found throughout the Enoree, and *Lepomis gibbosus*, *Notropis hudsonius*, and *Cyprinella spiloptera*, all found infrequently. Some fishes collected may represent range extensions.

8. COCKLIN, ROSS R., M. JASON TODD, AND MICHAEL E. DORCAS. Davidson College, Davidson, NC 28036—Temporal and spatial variation in anuran calling: Implications for conservation and monitoring programs.

Amphibian decline has been extensively documented over the past 10 years with a number of monitoring programs have been established to study amphibian populations. Many of these programs rely on calling surveys; therefore, information on temporally and environmentally induced calling variation can be used to optimize such surveys. We extensively surveyed two ponds near Davidson, North Carolina using data loggers to record environmental conditions and automated recording systems to monitor frog calling activity. Our objective was to compare daily and seasonal calling variation between the two ponds and determine how environmental variation affects calling behavior. Considerable seasonal variation in calling activity among the species was documented as *Pseudacris crucifer* began calling 5 days earlier at Thompson Pond than at Davis Pond. We also documented considerable daily variation in calling behavior as *Pseudacris triseriata* called more often and more intensely at Davis Pond than at Thompson Pond. Environmental variation also affected calling behavior as *Pseudacris triseriata* called 30% of the time at Davis Pond when shallow water temperature ranged from 12 to 14 °C and only 8% of the time above 20°C. This data provides a better understanding of factors that affect anuran behavior and can be used to optimize amphibian monitoring programs.

9. KRAL, LEOS G., STEPHEN M. BROGDON, SENETH D. FONSEKA, AND CHRISTOPHER R. TABIT. Department of Biology, State University of West Georgia, Carrollton, GA 30117. -Phylogeography of the Tallapoosa Darter, *Etheostoma tallapoosae*.

The genetic structure of the Tallapoosa Darter population in the Tallapoosa River system was determined by analysis of mitochondrial control region and cytochrome b nucleotide sequences, and also by RAPD-PCR analysis. The data suggest that there are at least two genetically distinct populations of the Tallapoosa Darter. One population occupies the tributaries of the Tallapoosa River above Harris Dam and the other population occupies the tributaries of the Little Tallapoosa River. Preliminary data suggest that the population in the tributaries of the Tallapoosa River below Harris Dam seems to be very closely related to the Little Tallapoosa River population.

10. WILLIAMSON, SCOTT AND A. FLOYD SCOTT. Department of Biology, Austin Peay State University, Clarksville, TN 37044—Natural history notes on a recently discovered population of *Sternotherus minor peltifer* (Stripeneck Musk Turtle) in Whiteoak Creek, Houston and Humphreys counties, Tennessee.

Whiteoak Creek is a tributary of the Tennessee River that flows westward through Middle Tennessee in parts of Houston and Humphreys counties. In the summer of 1999, three specimens of *Sternotherus minor peltifer* (Stripeneck Musk Turtle) were discovered in the creek's lower reaches. These records were well to the west and north of any previous reports for the species. Following this discovery, we initiated a study of *S. m. peltifer* in Whiteoak Creek to obtain information on its distribution, population attributes, and movements. Turtles were captured by hand while wading, canoeing, and snorkeling the creek. All captured specimens were weighted, measured, given an individual mark (notches in marginal scutes), and, when possible, sexed. Seven adults were fitted with radio transmitters. Six sites distributed along a 20-km reach of the creek produced 44 individuals. Females outnumbered males approximately 2 to 1 (25:14); juveniles numbered five. Twenty-eight individuals were found among ledges, crevices, and boulders of deeper pools along limestone bluffs. Eight were taken among submerged root masses, logs, limbs, and other organic debris not associated with bluffs. At the time of this writing, movement data were too limited to allow any generalizations. Funding for this project was provided by The Center for Field Biology, Austin Peay State University, Clarksville, TN 37044.



11. SCOTT, A. FLOYD AND SCOTT SUTTON. Department of Biology, Austin Peay State University, Clarksville, TN 37044. Distribution and movements of Alligator Snapping Turtles (*Macrochelys temminckii*) in the Tennessee portion of Kentucky Reservoir.

Although not reported until 1954, the first Alligator Snapping Turtle (*Macrochelys temminckii*) discovered in what is now Kentucky Reservoir (impounded Tennessee River) was found in 1938 near the community of Big Sandy, Benton County, Tennessee. Since then, 23 specimens from 10 additional localities in five counties have been documented. This report includes a detailed summary of the distribution data for the species in Kentucky Reservoir and presents the results of radio-tracking studies carried out over the past 5 years on four adults (2 males and 2 females) in lower Whiteoak Creek, which enters the reservoir in Houston County, Tennessee. Funding for this project was provided by The Center for Field Biology, Austin Peay State University, Clarksville, TN 37044.

12. DICKSON, NANCY J., KEITH A. JOHNSON, AND THOMAS K. PAULEY. Department of Biological Sciences, Marshall University, Huntington, WV 25755 - A Comparison of Historical Blanchard's Cricket Frog Sites in Western West Virginia to Current Sites in Southeastern Ohio.

Blanchard's Cricket Frog, *Acris crepitans blanchardi*, was historically found in four counties of West Virginia including Clay, Mason, Putnam, and Wayne. However, it has been many years since this subspecies has been found in those counties or any others in the state. While the populations of this frog have declined in western West Virginia, there are abundant populations found in southeastern Ohio. Populations in Ohio are less than 30 miles due west of the historical sites of Mason County, West Virginia. This study compared two historical sites in Mason County to two sites in Lawrence County, Ohio to determine any significant differences in the study areas. Comparisons made included water chemistry, relative humidity, dissolved aluminum and oxygen, ultraviolet light penetration, vegetation in and adjacent to the sites, predators in and around the sites, as well as air, soil, and water temperatures.

13. LOUDERBACK, VALERIE ANN, AND REX MEADE STRANGE. Department of Biology, Southeast Missouri State University, Cape Girardeau, MO 63701. -Male investment and reproductive strategy in the slabrock darter, *Etheostoma smithi*

The slabrock darter, *Etheostoma smithi*, is one of several species of egg-clustering darters of the subgenus *Catonotus*. Egg-clustering is a form of male resource-defense polygyny wherein males establish and guard nests under rocks. Males exhibit nest fidelity and may be restricted to the immediate area around the nest for foraging. Theory predicts that males will abandon nests once metabolic investment outweighs the probability of reproductive success. We examined the food habits of nest-guarding males, spawning females, and juvenile fish for evidence of a reduced diet in nest-guarding males. In general, the diet of *E. smithi* is consistent with information from previous life history studies. However, a disproportionate number of food items were found in the stomachs of females when compared with the contents found in the stomachs of males. We found an average of 18 food items per female, whereas stomach contents of males ranged from 0-3 food items. This disparity implies a high nutritive cost for males during nest guarding behavior.

14. MILLER, CLINTON E., MEGAN A. PARKER, AND MICHAEL K. MOORE. Department of Biology, Mercer University, Macon, GA 31207. -Impacts of Forest Management Activities on reptiles and amphibians in the Piedmont National Wildlife Refuge.

We have initiated long-term population studies of herpetofaunal species that occur in riparian woodlands and adjacent pine uplands in the Piedmont National Wildlife Refuge. The refuge is

located in Jones and Jasper counties in the southern Piedmont region of central Georgia. Trap arrays have been established within four 1000-acre refuge compartments that vary in their history of forest management practices (i.e., frequency and timing of burning and mechanical thinning). Each compartment contains 15 drift fence-pit fall-funnel trap arrays (PFA's), comprising a total of 60 pitfalls and 30 funnel traps per compartment. Early results (derived from late spring, summer and fall of 2000) show distinct weather-induced and seasonal patterns of activity among most species captured. In addition, presence and abundance of several species are positively correlated with a particular compartment treatment. Species lists and patterns of relative abundance will be discussed in the context of evaluating forest management practices common in southern Piedmont forests.

15. LAWRENCE, KAREN A. AND REX MEADE STRANGE. Department of Biology, Southeast Missouri State University, Cape Girardeau, MO 63701. -Comparative neuroanatomy and reproductive strategies among percids.

Spawning behavior in percids ranges from simple broadcasting of gametes by mixed male-female groups to territorial behavior accompanied by complex color and fin displays males use to elicit female choice. We examined the proportionate sizes of neural structures in 12 species of percids with the assumption that the size of a neural structure reflects its functional potential. We found a negative allometric relationship between brain and body mass among species: smaller fish have a relatively larger brain than larger fish proportionate to body mass. The optic tectum increases proportionately with standard length. The cerebrum is proportionately smallest in *Perca*, *Stizostedion*, and *Percina*. *Etheostoma* species have relatively larger cerebra, although no pattern based on either behavioral characteristics or phylogenetic legacy was apparent. Cerebellum size was greatest in *Stizostedion*, perhaps reflecting greater swimming activity than other percids. Darters of the subgenera *Catonotus* and *Oligocephalus* have the largest cerebellum among other darters we examined. The large cerebellum in darters is associated with coordination of fin movement, as expected for species that use fin or color displays as important components in their reproductive behavior.

16. HYDE, LINDA L.<sup>1</sup> AND BRETT A. LARSON.<sup>2</sup> <sup>1</sup>Division of Mathematics and Natural Sciences, Gordon College, Barnesville, GA 30204 AND <sup>2</sup>Biology Department, Armstrong Atlantic State University, Savannah, GA 31419-Detection of melatonin in *Fundulus heteroclitus* using an ELISA.

Melatonin, a critical hormone in the circadian systems of a number of animals, has traditionally been quantified using radioimmunoassays. The work described here was done to (1) explore the feasibility of using non-radioactive reagents to measure melatonin in *Fundulus heteroclitus* and (2) determine whether a difference in daytime and nighttime plasma melatonin levels could be detected in these small fish. Fish were captured in the wild and housed under a daily cycle of 12 hrs light and 12 hrs darkness for 3.5 weeks prior to blood collection. Enzyme-linked immunosorbent assay (ELISA) reagents manufactured for use with human plasma were used to evaluate fish melatonin levels at mid-day and mid-dark. According to the assay, plasma melatonin was  $91 \pm 7$  pg/ml (mean  $\pm$  SE) at mid-dark (n=14) and was undetectable at mid-day (n=15). These results are consistent with the expected changes in melatonin during the day and night, and they indicate that it is feasible to use an ELISA in obtaining plasma melatonin profiles for these fish.

17. FOX, CECILIA M.<sup>1</sup>, DANIELLE M. SMITH <sup>1</sup>, AND WAYNE A. CASS <sup>2</sup>. <sup>1</sup> Department of Biology, Wingate University, Wingate, NC 28174 and <sup>2</sup> Department of Anatomy and Neurobiology, University of Kentucky College of Medicine, Lexington, KY 40536. -Neurochemical analysis of the protective effects of antioxidant therapy in the rat model of Parkinson's disease.

Parkinson's disease is a progressive neurodegenerative disorder characterized by resting tremor, muscular rigidity, bradykinesia and impaired postural reflexes. The primary pathology of this disease is degeneration of the nigrostriatal pathway. There is significant research implicating free radicals in the manifestation of neurodegenerative disorders such as Parkinson's disease, Alzheimer's disease and amyotrophic lateral sclerosis. Therefore, it is reasonable to postulate that antioxidant therapies may be neuroprotective and reduce the progression of these diseases. In a study previously reported from our lab, it was demonstrated that daily Vitamin E treatment four weeks prior to an intranigral 6-OHDA lesion in Fisher 344 rats could significantly protect dopamine neurons in the substantia nigra. The purpose of this experiment was to examine whether Vitamin E treatment could enable surviving dopamine neurons to maintain normal dopamine production and metabolism in the substantia nigra following this same 6-OHDA neurotoxic lesion. Levels of dopamine and its metabolite, DOPAC were evaluated.

18. M. JASON TODD<sup>1</sup>, KRISTINE L. GRAYSON<sup>1</sup>, WILLIAM A. HOPKINS<sup>2</sup>, ROBERT E. GATTEN, JR.<sup>3</sup>, AND MICHAEL E. DORCAS<sup>1</sup>. Dept. of Biology, Davidson College, Davidson, NC 28036<sup>1</sup>; Savannah River Ecology Lab, Aiken SC, 29802<sup>2</sup>; Dept. of Biology, University of North Carolina, Greensboro, NC 27412-The effects of food type on specific dynamic action in the chocon horned frog (*Ceratophrys cranwelli*).

After feeding, many animals exhibit a large increase in their metabolic rates. This effect, termed the Specific Dynamic Action (SDA), reflects the energetic cost of processing nutrients. Most studies have shown SDA to be greater in animals that eat infrequently, such as large pythons. This cost of food processing has important implications for the nutritional benefits received from the prey that sit-and-wait predators consume. To better understand the effects of nutritional content on SDA in a sit-and-wait predator, we measured the SDA of horned frogs, *Ceratophrys cranwelli*, after eating 10% of their body mass in earthworms or 10% of the their body mass in mice. We measured their oxygen consumption using a flow through respirometry system (Oxymax, Columbus Instruments). Additionally, we measured the nutritional content of mice and worms. Preliminary results indicate a large SDA after ingestion and little difference between SDA when frogs were fed mice versus when frogs were fed worms. Evaluation of the nutritional analyses will allow us to determine the energetic costs and benefits associated with prey type.

19. MINIS,SARAH R., GLENN T. GHOLSTON, MATHIUS J. SEDIVEC Departments of Psychology and Biology, Appalachian State University, Boone, NC 28608. – Why enhancng cholinergic transmission may worsen deficits from basal forebrain lesions.

A theoretically sensible treatment for brain injury can sometimes be ineffective because the treatment has unintended effects. 1,1,3 Tricyano-2-amino-1-propene (Triap) is a drug that increases acetylcholine (ACh) transmission by enhancing choline acetyltransferase (ChAT) activity. Triap (20 mg/kg) was given to 4 of 8 rats with excitotoxic lesions (9nmol AMPA) of the medial septum/diagonal band of Broca (MS/DB) in an attempt to overcome Hebb-Williams maze solving deficits. Across a series of 8 sessions of 4 trials, both Triap-treated and vehicle-injected MS/DB rats made more maze solving errors (51%±4%) than a control group with sham lesions ( $\bar{n}=4$ ; 35%±3%,  $p<.05$ ). However, the Triap-treated group committed 81% more errors on working memory trials (Trials 2, 3, 4;  $t(162)=3.37, p<.05$ ) and 5.6 times more repeat blind alley errors than the vehicle-treated group with lesions. Triap was expected to mitigate memory deficits by increasing ChAT activity at remaining ACh terminals in the hippocampus. Behavioral data suggest that even if Triap enhances cholinergic activity in the hippocampus, it may also over activate ACh transmission elsewhere. Histology may reveal increases ChAT activity in areas receiving ACh reticular activation formation inputs which would explain increased repetitive behavior in treated rats.

20. WOODSIDE, MARIA V. Southeastern Louisiana University, Hammond, LA 70402.-Xenobiotic estrogens and their effects on tadpole production of vitellogenin.

Man made chemicals such as the pesticide DDT and its metabolites have been shown to mimic estrogen. These mimicking effects disrupt endocrine pathways, which could lead to interference in physiological and developmental processes of vertebrates. I investigated the effect of the DDT metabolite o,p'DDD (1-(2-chlorophenyl)-1-(4chlorophenyl)-2,-2trichlorethane), on the production of the egg yolk protein vitellogenin in tadpoles. Vitellogenin is normally produced in mature females in response to estrogen stimulation. Production of vitellogenin in tadpoles is an indication that they have been exposed to an estrogen mimicking substance. Protein extracts from treated tadpoles were electrophoretically separated on a polyacrylamide gel. Vitellogenin expression was analyzed by Western blot using a polyclonal antibody directed against purified *Xenopus laevis* (African clawed frog) vitellogenin. Vitellogenin was detected in tadpoles treated with o,p'DDD, suggesting that o,p'DDD did act as an endocrine disrupter by mimicking estrogen. These pesticides are widely used in our environment. From further research we can learn more about the potentially devastating biological damage that these estrogenic mimicking compounds are causing. Funded by an OSCAR grant for undergraduate research (SLU).

21. EMRICK, VERL R., TYLER P. STANTON, AND REBECCA L. MURRAY. Conservation Management Institute, Virginia Tech College of Natural Resources, Blacksburg, Virginia 24061-Habitat selection of the Bachman's sparrow (*Aimophila aestivalis*) at Fort Pickett Maneuver Training Center, Virginia.

Bachman's sparrow (*Aimophila aestivalis*) a Virginia state threatened species, was first identified at Fort Pickett-Maneuver Training Center (FPMTC) in 1993. Detailed vegetation data was collected within Bachman's sparrow habitats in 1994, 1999, and 2000. Prior to 2000, Bachman's sparrow had only been observed in the controlled access area (CAA). The CAA serves as a buffer zone for various live fire military exercises which result in frequent wildfire. The frequent occurrence of fire has led to the development of several relatively rare fire maintained habitats. Within the CAA, Bachman's sparrows were found in pine and oak savannas. These habitats typically have a scattered tree (5+m) and shrub stratum (1-4m) with a dense herbaceous stratum (>1m) comprised of native grasses. In summer of 2000, two males were observed singing at sites outside of the CAA. The habitats at these sites contrasted to those utilized within CAA. The tree stratum was nonexistent, while the shrub stratum was considerably more dense. The herbaceous stratum was similar, though more diverse. The dissimilarity in habitat can be attributed to differing types of disturbance. The availability of exposed perches is likely an important factor in habitat selection for Bachman's sparrow.

22. HINKLE, C. ROSS AND PAUL A. SCHMALZER. Dynamac Corporation, Kennedy Space Center, Florida--Environmentally Endangered Lands Acquisition and Conservation Program in Brevard County, Florida.

In 1990 Brevard County voters approved an ad valorem tax to collect up to \$55M for the acquisition and management of conservation lands to protect biodiversity. A scientific advisory committee was established to select the lands and to develop management plans for the conservation areas. After ten years approximately 6000 ha of environmentally endangered lands have been protected. These areas are critical to conservation of coastal barrier island, Florida oak scrub and coastal wetland landscapes. The successful long-term survival of protected species such as the Florida scrub jay (*Aphelocoma coerulescens*), eastern indigo snake (*Drymarchon corias couperi*) and plant endemics such as the scrub mint (*Dicerandra thimicola*) depend upon these publicly owned conservation areas. Current program activities are focused upon establishing management plans for the sites and the development of four environmental education centers to inform the public about the natural, Florida landscape and conservation issues important to protecting biodiversity.

23. STRAIT, S. G., R. AYOGB AND S. SMITH. Department of Biological Sciences, Marshall University, Huntington, WV 25755-Three-dimensional laser digitizing for visualization and quantification of fossil teeth.

Increasingly important is the ability to quantify complex morphological structures. This project describes how modern quantification and image analysis techniques are applied to the fossil record. During the early Eocene (55 million years ago) there were two genera (*Ectocion* and *Copecion*) of extinct ungulates (phenacodontids) that lived sympatrically throughout North America. This project will use state-of-the-art measurement and image analysis technologies to discover discrete morphological characters that will easily distinguish these two taxa. *Ectocion* and *Copecion* fossil teeth will be scanned in five views with a laser digitizing system. In order to align multiple scans, a set of reference points to integrate these images into a single file. Once the orientations have been joined, reduction of data points is necessary before it is possible to generate a 3D surface model from the point data. It will be possible to adjust two specimens to the same scale and overlay their images. The resulting visual display will highlight the 3-D areas that differs between the two specimens (i.e., perform an image subtraction) so that diagnostic characters between these two species can be easily visually examined. Comparisons of this sort between *Ectocion* and *Copecion* will also be used to suggest areas that should be measured.

24. AGOSTA, SALVATORE J., AND DAVID MORTON. Dept. Biology, Frostburg State University, Frostburg, MD 21532.-Spatial and temporal dietary variation by the big brown bat in Pennsylvania and western Maryland.

The range of the big brown bat (*Eptesicus fuscus*) is extensive, and its diet has been examined in a number of locations. This bat is abundant in many ecosystems and plays an important role as a predator of nocturnal insects. Big brown bats are also of economic importance because they prey on a variety of agricultural insect pests. As little previous dietary information existed for this species in the region, we used fecal analysis to examine the diet of big brown bats from roosts in Pennsylvania and Maryland. At a maternity colony, we collected weekly samples from March 2000 to September 2000. Temporal variation in prey selection existed. Overall, scarabs and other beetles were the most important prey items. Other prey items included winged-ants, stink bugs, ichneumonid wasps, moths and crane flies. Big brown bats are a focal species for the Pennsylvania Game Commission, Wildlife Diversity Section's bat box program. We propose supplementing such programs with literature (e.g., pamphlets, fact sheets) that informs the public of the specific food habits of bats.

25. BROWN, DAVID. Ecology and Evolutionary Biology, Tulane University, New Orleans, LA 70118.-The effect of winter climate on breeding season population size of neotropical migrant songbirds.

Research over the past three decades has documented declines in several populations of neotropical migratory songbirds. This trend has sparked demographic research to determine what factors limit populations of migrant songbirds. Most research has focussed on the breeding grounds, but over the last decade the emphasis has shifted to include stopover and wintering areas. The hypotheses for population limitation have largely mirrored this seasonal separation by claiming isolated or additive effects of breeding, wintering, and stopover events. Recent work, however, suggests that effects in one season may carry over to following seasons. This has been called the Seasonal Interaction Hypothesis. I explored this hypothesis by looking for correlation between winter season climate patterns and the change in bird population size from the previous to the subsequent breeding season. I used the El Nino Southern Oscillation index (ENSO) as a measure of climate patterns for each winter from 1966-1998. Bird population size was calculated for several passerine species using the North American Breeding Bird Survey (BBS).

26. ALVERSON, JANET AND ALLEN C. COHEN. U.S. Department of Agriculture, Agricultural Research Service, Biological Control and Mass Rearing Research Unit, Mississippi State, MS 39762-5367. -Effect of anti-fungal agents on biological fitness of *Lygus hesperus* Knight.

Artificial diets have become important components of rearing systems for insects that are reared for research purposes and in commercial production. Because the rearing conditions for insects also provide ideal settings for mold growth, anti-fungal additives are often used to reduce diet contamination. However, the anti-fungal agents must not only be effective in mold suppression, but they must also be safe to the target insects of the rearing programs. Five anti-fungal agents (methyl paraben, benzoic acid, sorbic acid, formaldehyde, and propionic acid) were tested using diet bioassays on *Lygus hesperus* Knight and the effect on biological fitness was measured. Biological fitness was defined as total number of survivors, adult fresh and dry weights, time to adult emergence, time to start of egg laying, and egg production. Methyl paraben, formaldehyde, and high doses of propionic acid and benzoic acid were found to have significantly negative effects on these measurements of biological fitness. Challenge tests to determine the ability of the anti-fungal agents to suppress mold growth when inoculated into the diet medium are currently in progress.

27. TOWLER, WILLIAM I.<sup>1</sup>, JAVIER PONCE SAAVEDRA<sup>2</sup>, BENJAMIN GANTENBEIN<sup>3</sup>, AND VICTOR FET<sup>1</sup>. <sup>1</sup>Dept. Biological Sciences, Marshall University, Huntington, WV 25755, <sup>2</sup>Facult. Biología, Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Michoacán, CP 58060 México, and <sup>3</sup>Institute of Zoology, University of Bern, CH-3012 Bern, Switzerland-Mitochondrial DNA systematics of Central Mexican *Centruroides* (Scorpiones: Buthidae).

Several species of highly toxic *Centruroides* inhabit Central Mexico. Relationships between common species and subspecies, *C. infamatus infamatus*, *C. i. ornatus*, *C. limpidus limpidus*, and *C. l. tecomanus*, are not resolved; existing taxonomy is based on a few morphological characters. Comparison of DNA sequences of ribosomal genes provides a new and powerful tool to examine such situations. Scorpions were collected from 12 different localities in Michoacán, Querétaro and Guerrero, México; collection sites varied in altitude (from 300 to 1940 m a.s.l.) and ecology. DNA sequences of the mitochondrial 16S rRNA gene reveal a complex taxonomic situation. At least three separate lineages are confirmed, with the 6-18 % sequence divergence. Comparison with other buthid species (*Mesobuthus* from West and Central Asia; our data) show that similar level of divergence is exhibited by congeneric morphospecies. It is suggested that *C. i. ornatus* may deserve a species status.

28. PURVIS, M.E. AND KHAN, R.N. Department of Biology, Armstrong Atlantic State University, Savannah, GA.- Effects of rostrum ablation on locomotion and prey capture by grass shrimp *Palaemonetes pugio*.

Rostrum is the anterior median extension of the head carapace of crustaceans and serves as an important morphological feature used to differentiate various species of grass shrimps belonging to genus *Palaemonetes*. Field observations occasionally reveal individuals of *Palaemonetes pugio* with various degrees of rostral damage. Consequently, we are investigating the effects of rostral ablation on the shrimp's locomotory and feeding behavior within a laboratory setting. Selected shrimp individuals had their rostrum ablated using a scalpel. Thereafter, they were categorized based on their rostral presence or absence (0% ablation (control), 50%, and 100% ablation) and were maintained in a saltwater tank for further analysis. Monitored activity levels, that included swimming and walking, were found to significantly increase as the degree of ablation increased. Prey capture studies involving the brine shrimp *Artemia* is currently underway. Shrimps belonging to the above-mentioned classes with regards to their rostral structures are being starved for 48 hours and their prey capture rates are being documented. Since rostrum is a balancing organ of crustaceans, our



preliminary findings reveal that any degree of damage to this structure may significantly alter the shrimp's locomotory patterns in their natural habitat, among other physiological activities.

29. JORGENSEN, DARWIN, TREVOR WILKES, AND LEA BEAULIEU. Biology Dept., Roanoke College, Salem, VA 24153 – Respiratory support of submerged walking in the blue crab, *Callinectes sapidus*.

The blue crab, a migratory decapod crustacean, moves about underwater by swimming and walking. We monitored respiratory function in blue crabs while they walked at a steady rate on a submerged treadmill. Blue crabs have two gill sets each occupying a laterally-located enclosed space, the branchial chamber (BC). Each BC has a muscularly-driven pump, the scaphognathite (scaph), which generates a cyclic, suction pressure to move water unidirectionally past its gill set and through an exhalant opening located lateral to the mouth. Acrylic masks situated over these openings directed exhalant water from each BC through an electromagnetic flow probe, allowing for bilateral, pulsatile ventilation to be monitored. Hydrostatic pressure in each branchial chamber also was monitored. Exhalant water pO<sub>2</sub> measurement allowed for: 1) the determination of oxygen extraction from the ventilatory stream and, in combination with ventilation data, 2) calculation of oxygen uptake. Steady state walking was supported by a 5-fold increase in ventilation rate, about 20% of which resulted from increased scaph stroke volume. Oxygen uptake increased by about 6-fold. BC pressure decreased by about 6-fold, suggesting a potential passive dilatory effect on gill hemolymph channels during exercise. Functional mismatch of the two gill sets was noted.

30. BOHLMANN, TIFFANY A. AND PAMELA G. GREGORY, Jacksonville State University- Reproductive biology of the ground cricket *Allonemobius socius*.

Studying the reproductive biology is required to fully understand the reproductive barrier that exists between two species of ground crickets, *Allonemobius socius* and *A. fasciatus*. *Allonemobius fasciatus* and *A. socius* are ground crickets that inhabit short grassland areas in the northeastern and southeastern United States and west at least to Illinois. Histological studies are being conducted to describe the reproductive anatomy of both males and females. Males secrete an external spermatophore (a special chitinous structure containing sperm) that he transfers to the female. The sperm are transported from the spermatophore through a tube that is inserted into the bursa of the female and subsequently stored in the females' spermatheca, a sperm storage organ. These studies will provide preliminary information needed for studying the physiology of reproductive isolation between the two species of ground crickets that will hybridize to a limited extent in areas where both species occur.

31. NORMAN, MAI-KIM S. Bowie State University, Bowie, MD 20715. –The microbial communities in graywater and graywater/blackwater bioreactors.

Graywater and graywater/blackwater bioreactors were used to treat and reduce Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), and fecal coliforms in graywater and graywater/blackwater waste streams. Microbial communities were studied within the bioreactors in order to optimize a system in which wastewater can be treated in such a way that it will meet the UNDS standards. Weekly samples of the feed streams and processing tanks were taken and examined for total aerobic bacterial counts, lipase-producing bacteria, gelatinase-producing bacteria, total coliforms, fecal coliforms and *E. Coli*. Total aerobic bacterial counts were higher in the operation bioreactors, as compared to feed streams, indicating a viable biomass was formed in the operating systems. Graywater and graywater/blackwater bioreactors produced similar microbial populations, but the coliform levels in the graywater bioreactor were less than in the graywater/blackwater bioreactors. Future work will correlate the microbial populations with parameters such as TSS and BOD to gain a better understanding of the bioreactor operation states.

32. ALLEN, L.,<sup>1</sup> R. KERSTETTER<sup>1</sup>, J. LESHER<sup>2</sup>, S. SCHAFFER<sup>1</sup>, L. PHAM<sup>1</sup>, M-K LIAO<sup>1</sup>. <sup>1</sup>Biology Dept., Furman University, Greenville, SC 29613, and <sup>2</sup>Trinity University, San Antonio, TX 78212—Effects of land use on fecal coliform levels in selected watersheds of the Enoree River, Upstate SC.

In June and July of 2000, water samples were collected from Brushy Creek and Kings/Indian Creek tributaries of the Enoree River, and tested for total coliform and *Escherichia coli* levels using the IDEXX Colilert™ system. Kings/Indian Creek is a forested watershed (2.25% urban) that is part of the Sumter National Forest. Brushy Creek is a highly urbanized watershed (71.1% urban) located partially in the city limits of Greenville, SC. Kings/Indian Creek was found to have significantly higher *E. coli* levels than Brushy Creek. Average *E. coli* levels at the forested watershed were 2236 cells/100ml and the average level at the urban watershed was 314 cells/100ml. Total coliform levels were also higher at the more forested area, although not significantly. It is possible that the abundance of free-ranging wildlife and grazing animals in Kings/Indian Creek drainage were responsible for higher *E. coli* levels. In any event, *E. coli* and coliform levels in an urban watershed with sewage treatment effluent were lower than *E. coli* levels in a rural/forested drainage.

33. PHAM, L.<sup>1</sup>, S. SCHAFFER<sup>1</sup>, R.E. KERSTETTER<sup>1</sup>, L. ALLEN<sup>1</sup>, AND J. LESHER<sup>2</sup>. <sup>1</sup>Biology Dept., Furman University, Greenville, SC 29613, and <sup>2</sup>Trinity University, San Antonio, TX 78212—The impact of rain on coliform bacterial counts in the Enoree River, SC.

The focus of our research was to determine whether changes in fecal coliform and *Escherichia coli* counts in river water are correlated with rainfall. Our protocol involved collecting samples, before and after significant rainfall, at five sites representing different land use patterns along the Enoree River, SC. The results of sampling showed that there was an overall increase in both fecal coliform and *E. coli* numbers after significant rainfall at four of the five sites sampled. For example, at the Taylors, SC site, upstream from a waste treatment facility, fecal coliform counts increased from an average of 4853 cells/100ml to 67607 cells/100ml following rainfall and *E. coli* levels increased after rainfall from an average of 41.6 cells/100ml to 82.5 cells/100ml. The only exception was at a site downstream from the waste treatment facility near Pelham SC. At the Pelham site fecal coliform counts decreased from an average of 16576 cells/100ml to 9662.5 cells/100ml, while its *E. coli* count increased from an average of 71.6 cells/100 ml to 79.5 cells/100 ml. However, our results generally support the hypothesis of a positive correlation between high rains and fecal coliform and *E. coli* counts in river water.

34. HUNDLEY, JESSICA L. AND ISAURE DE BURON. Department of Biology, Converse College, Spartanburg, SC 29302 – Completed description of *Hypoechinorhynchus thermaceri* (Palaeacanthocephala) a parasite of the hydrothermal vent fish, *Thermarces cerberus* (Zoarcidae).

The acanthocephalan *Hypoechinorhynchus thermaceri* was found in the intestine of several zoarcid fish, *Thermarces cerberus*, collected at 2,600 m depth during the HOPE 99 expedition (CNRS/IFREMER, France) on the East Pacific ridge (13°N EPR). The availability of numerous well-preserved specimens has allowed the completion of the description of this species, which up to this point was inadequate. Additionally, the presence of gravid females allowed the confirmation of *T. cerberus* as definitive host of this parasite species. The life cycle of *H. thermaceri* is currently under study.

35. LESHER, J.<sup>1</sup>, L. ALLEN<sup>2</sup>, AND R.E. KERSTETTER<sup>2</sup>. <sup>1</sup>Trinity University, San Antonio, TX 78212, and <sup>2</sup>Biology Department, Furman University, Greenville, SC 29613—Effect of sediment agitation on total coliform and *Escherichia coli* levels in the Enoree River, SC.



Total coliform and *Escherichia coli* concentrations were monitored along the Enoree River, South Carolina, for eight weeks. Mean *E. coli* levels for the eight week sampling period ranged from 75.3 cells/100 ml to 3507 cells/100 ml along the 27 sites sampled. Many of these values are well above SC freshwater standards and cannot be adequately explained by point sources. One possible explanation for these results is that bacteria are harbored in the sediment of the riverbed and later re-suspended into the water column. This study simulated a rain event by agitating the sediment to determine if re-suspended bacteria enter the water column during an event, like rainfall, that disturbs the riverbed. At three sampling sites both above and below sewage outfall, total coliform and *E. coli* levels were measured using the IDEXX Colilert system before and after the disruption of the riverbed. In addition, the top layer of sediment was analyzed to compare levels of coliform and *E. coli* in the sediment to those in the water column. On average, *E. coli* levels increased by 84% after the agitation of the riverbed while coliform levels increased by 4%. This suggests that the re-suspension of sediments could adversely affect water quality.

36. BROOKS, HARRY, GINGER LAYNE, AND CHARLES SOMERVILLE. Marshall University Department of Biological Sciences, Huntington, WV 25755 -Survey of antimicrobial activities in extracts of common plant materials.

Folk medicine traditions remain strong in Appalachia, and many of the plants used in that tradition are finding acceptance in the public and medical communities. This study surveyed extracts of common plant materials for their ability to inhibit the growth of bacterial and yeast cultures. The plant materials tested include Cilantro, Clover sprouts, Cranberry juice, Echinacea, Ginkgo leaves, Ginkgo seeds, Kudzu, Marigold, Orange peel, Poison Ivy, Potato, Potato peel, and Saint John's Wort (fresh and dried). Extracts of plant materials were made using acetone, ethanol, ethyl ether, hot water infusion, methanol, oil maceration, and petroleum ether. The yeast *Candida albicans* and the bacteria *Salmonella enteritidis*, *Escherichia coli*, *Micrococcus luteus*, *Vibrio fischeri*, *Pseudomonas aeruginosa*, and *Serratia marcescens* were tested for growth inhibition. A total of 328 extract/strain combinations were tested, 77 of which resulted in demonstrable growth inhibition. Extracts of Kudzu inhibited all of the test organisms. Extracts of potato did not inhibit any of the test organisms. Ethanol or petroleum ether extraction generally produced the best results from a single plant material. Hot water infusion usually failed to produce active extracts. The most active extracts are being analyzed by HPLC in order to isolate and identify the antimicrobial components.

37. JORDAN, NIKISA S.<sup>1</sup>, MEHRAN PAZIRANDEH <sup>2</sup>. <sup>1</sup> Dept of Biological Sciences, Bowie State University, Bowie, MD 20706 and <sup>2</sup> Center for Bio/Molecular Science and Engineering, Naval Research Laboratory, SW Washington D.C 20375. – Thioesterase I of *Escherichia Coli*.

Thioesterase I (TE) from *Escherichia Coli* was cloned and expressed using the pMal-p and pMal-c expression vectors. The expressed enzyme was affinity purified from cultures and was studied for it's potential to catalyze various reactions. Thioesterase I was expressed both as a cytoplasmic and periplasmic protein although in nature the *E. coli* TE is periplasmic. The cloned gene was about 600 base pairs and codes for 182 amino acids. The expression of the gene resulted in the production of a recombinant protein of MW 66kDa, which is of the expected size. The recombinant protein is larger than the expected molecular weight of the TE, which is 22 kDa because it is expressed as a fusion protein with the maltose binding protein, which is 45 kDa. Variants of the TE I enzyme was attempted by incorporating various amino acids, such as the His patch and Asp-Glu patch. The results of these studies suggests that the expression levels of the enzyme are adequate for initial studies but expression systems will need to be investigated to increase the amount of enzyme that can be produced.

38. SPIERS, J.A., KHAN, R.N., AND PUNG, O\*. Department of Biology, Armstrong Atlantic State University, Savannah, GA. and \*Georgia Southern University, Statesboro, GA.- Activity levels of grass shrimps, *Palaemonetes pugio*, influenced by parasitic trematodes *Microphallus turgidus*.

Grass shrimp, *Palaemonetes pugio*, are very common shallow water crustaceans along the Atlantic coast of the U.S. These shrimps are hosts to a variety of parasites, including the trematode parasites *Microphallus turgidus*. These parasites evoke attention because they infect commercially important crustaceans. *Palaemonetes pugio* serve as second intermediate hosts for this parasite. Prevalence studies from several field stations along the Georgia coast revealed over half of these grass shrimps to harbor the parasite's metacercarial cysts. Further research focused on the shrimp's activity levels that were analyzed via swimming, walking, and resting behavior patterns. This study was performed in order to determine if the activity levels of these intermediate hosts were altered by increased number of trematode cysts. We compared control (unparasitized) and parasitized individuals; the latter were classified in 3 categories based on numbers of cysts present (1-10, 11-20, and 20-30). Overall, the activity levels were modified significantly in parasitized grass shrimp when compared to unparasitized individuals. As the number of cysts increased, the host's locomotary activities proportionately declined. The presence of cysts within their abdominal muscle perhaps interferes with the shrimp's activity patterns and may explain our findings.

39. WEILAND, DANIEL M. AND LEON L. LUNDIE Jr. Appalachian State University, Boone, NC 28607- Nutrient dependent production of novel antibacterial compounds by putative brittle star subcuticular bacteria.

In the investigations of the synthetic origins of marine metabolites, circumstantial evidence has often lead to the suspicion that some compounds are bacterial in origin. The most common route of investigation involves the isolation and culture of bacteria from the secondary metabolite-producing organism, followed by an analysis of the cultures for the metabolites of interest. Several antibiotic-producing organisms are induced to manufacture their compounds when stressed for certain nutrients. More specifically, amino acid starvation, linked to the *relA* dependent stringent response, is thought to be crucial to induce production of antibiotic in some [*Bacillus*] species. In our studies, subcuticular bacterial isolates have been found to exhibit antibacterial effects towards a broad spectrum of test organisms. Rapid streak assays were used to determine antibacterial activity. Preliminary data has shown that protein starvation does not induce or increase the production of the unknown antibacterial compounds. Conversely, our data shows that available protein appears to have a direct relationship to the amount of antibiotic produced.

40. WHITE, RHONDA M. AND MARTHA J. POWELL. The University of Alabama, Tuscaloosa, AL 35401--Oomycete infections of turtles.

Complex interactions between microbial pathogens and environmental stress may be key factors in the recent declines in reptile populations. Although fungal infections of turtles are well documented, there has only been one report of a heterotrophic stramenophile (oomycetes) parasitizing turtles. To expand on our understanding of potential microbes that could infect turtles, we have observed the incidence of oomycetes that infect turtles in captivity. Upon examination of turtles held in dense colonies or under hibernation conditions, we have isolated at least three genera of oomycetes. These include *Achlya* and *Aphanomyces*, and a third uncharacterized genus. Turtles that have been infected are common snapping turtles, *Chelydra serpentina*, western painted turtles, *Chrysemys picta belli*, and eastern painted turtles, *Chrysemys picta picta*. Areas of infection include eyelids, limbs, tails, and shells. Post-mortem examination of these turtles suggests that the infection is present in the skin but not in the underlying muscular tissue. This research is significant because it predicts the frequency of these types of infections and leads to a greater understanding of the impact microbial pathogens may have on reptile populations worldwide.

41. WILSON, CYNTHIA, MARK MEADE AND CHARLES OLANDER. Department of Biology, Jacksonville State University, Jacksonville, AL 36265--Sublethal effects of Phloxine B on population growth kinetics and aerobic metabolic rates in *Tetrahymena* spp.

Phloxine B is a halogenated xanthene dye that is FDA approved for use in human cosmetics and drugs. It has been suggested that the compound could be further used as an effective pesticide. Research examining the effectiveness of photoactive dyes, such as Phloxine B, as pesticides has been conducted since the early seventies. Toxicity to target organisms varies among species and ranges in concentration from 10-1000ppm. Studies examining the toxicity of Phloxine B to ciliate protozoan pathogens, including *Ichthyophthirius multifiliis*, are currently being conducted. FDA approval of phloxine B for use as in treating aquatic pathogens, however, is contingent on toxicity studies examining both target and non-target species. *Tetrahymena* spp. are commonly used for toxicological evaluations. Currently we are examining the effects of sublethal concentrations of Phloxine B on population growth kinetics and aerobic metabolic rates in non-target *Tetrahymena* spp. based upon toxicity concentrations determined for target species.

42. DOFFITT, CYNTHIA M.<sup>1</sup>, JOY M. HOLT<sup>1</sup>, EARL H. WEIDNER<sup>2</sup>, AND ANN M. FINDLEY<sup>1</sup>. <sup>1</sup>Dept. of Biology, University of Louisiana at Monroe, Monroe, LA 71209; <sup>2</sup>Dept. of Biological Sciences, Louisiana State University, Baton Rouge, LA 70803. --Early Carbohydrate Metabolism and Aerobic Enzyme Analysis of *Spraguea lophii* (Microsporidia).

Hatched sporoplasms of *Spraguea lophii* (Microsporidia) can be maintained for periods of up to 48 hours in Medium 199 supplemented with 5 mM ATP. With extended maintenance of this intracellular parasite, early carbohydrate metabolism of these vegetative cells can be monitored. Cyclic pulses of glucose production are followed in time by the appearance/disappearance of pyruvate and lactic acid. The role of trehalose catabolism in microsporidian carbohydrate metabolism is investigated. In addition, the overall nature of aerobic metabolic capabilities in the Microsporidia is assessed by the spectrophotometric analysis of spore lysate catalase, peroxidase, and superoxide dismutase levels.

43. ODOM, ALLISON, ANDREA WOLFE, AND JAMES RAYBURN. Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265--Effects of Meclizine on Developing Embryos of the Grass Shrimp *Palaemonetes pugio*.

Meclizine, an antihistamine used to treat nausea and vomiting, has proved to be a potent teratogen in rats; causing abnormalities such as, cleft palate, small mouth, short limbs, receded lower jaw, and uncalcified vertebral bodies in rat offspring. Shrimp Embryo Teratogenesis Assay-*Palaemonetes* (SETAP) is an indicator of potential environmental teratogenic hazards. For validation of SETAP, a comparison to the results of meclizine in the Frog Embryo Teratogenesis Assay-*Xenopus* (FETAX) will be made. This project involves the exposure of meclizine to the early life stages of *Palaemonetes pugio*, a grass shrimp found in the gulf coast. Shrimp embryos are tested within the same developmental range as FETAX embryos and with the same concentrations of meclizine ranging from 1mg/L to 150 mg/L. An estimate of the lethal concentration to cause 50% death (LC 50) is approximated using a twelve-day test. Observations in malformations will be digitally recorded using an image analysis system. This data can be used to determine the relative toxicity and teratogenicity of chemical exposure to grass shrimp embryos. Test results of SETAP will then be compared to previous test results with meclizine using the Frog Embryo Teratogenesis Assay-*Xenopus* (FETAX).

44. JETER, DIONNA T. The Center for the Integrative Study of Animal Behavior, Indiana University at Bloomington, Bloomington, Indiana 40746–The effect of chemosensory predator cue on morphological characters and escape behavior on *Hyla chrysoscelis*.

Anti-predator strategies such as recognizing chemosensory stimuli play an important role in the life history of larval anurans. This study examines the effects of a chemosensory predator cue on tadpole morphology. Tadpoles (108) were randomly assigned to 1 of 4 treatment groups with variables of cue and film. Filmed tadpoles were placed in an arena, where swimming behavior, in response to a simulated predator attack, was recorded. Morphology and escape behavior was recorded every 9 days until metamorphosis. Digital images of each individual were measured and body length, tail muscle width, tail length, and fin height was recorded. The results show that body and tail length were not affected by treatment. Tail muscle width and fin height was significantly different. Treatment by time interaction was not significant for any of the characters, however, tail muscle width did show a trend for a change.. It appears that tadpoles respond to chemosensory signals of predator proximity and alter the development of particular structures involved in anti-predator escape behavior.

45. LOCKETT, JARON. Minority International Research & Training, Egerton University, Kenya–An Investigation of Pesticide Residues in Water, Fish, and Sediment, from Lake Naivasha, Kenya.

Lake Naivasha, Kenya, which is domestically used, was examined to determine the presence and amount of organochlorine pesticide residues. Water, sediment, and fish samples were collected and analyzed. The sediment samples were oven dried for two days to remove all moisture and then crushed into a fine power. The fish samples were filleted and all portions that are consumed were removed and crushed into a paste. Each sample types were mixed with a fifteen percent (15%) diethyl ether in hexane solvent three times to extract any pesticide residues. Once the samples were extracted, each sample was then run through a gas chromatograph equipped with an Electron Capture Detector (ECD) where the detection of organochlorine pesticides was determined. Several samples were found to contain organochlorine pesticides. The Marula sediment sample was found to have the largest count of an individual pesticide, with the Mirex sample found to be 15.6 5.42 parts per billion (ppb). Of the fish samples tested, Tilapia #2 contained the highest pesticide count of an individual pesticide, with Mirex levels in this fish being 12.09 0.76 ppb.

46. BUSBEE, STEVEN\* AND WILLIAM H. CONNER. Department of Forest Resources, Clemson University, Clemson, SC 29634 and Baruch Institute of Coastal Ecology and Forest Science, Georgetown, SC 29442–An Ecological Characterization of Three Seasonally Flooded Isolated Ponds on the Waccamaw Neck, South Carolina.

Seasonally flooded isolated wetlands are common throughout the southeastern US. They are frequently called by a variety of names including non-alluvial depressional wetlands, limesink ponds, Carolina bays, Grady ponds, and cypress ponds. These shallow basins are not connected to streams or lakes, and their hydrology is driven primarily by rainfall and shallow subsurface water flow. Occasionally, they dry out during droughts such as occurred in 2000. They support unique communities of plants and animals adapted to cycles of wetting and drying and are important habitats for breeding amphibians and invertebrates. Overall, there is an absence of data on these habitats. To effectively conserve these areas, we need to know more about them. The objective of this project was to characterize plant and animal populations in three seasonally flooded wetlands. The study was done on the Waccamaw Neck of coastal South Carolina in seasonally flooded ponds located on Hobcaw Barony and DeBordieu just north of Georgetown, SC. Tree growth and litterfall were monitored in two 20 m X 25 m plots in each wetland. Herpetofauna was collected and examined using drift fences, coverboards, and

PVC pipes. Fish were sampled throughout the year by means of galvanized standard funnel-end minnow traps.

47. HARPER, CARLA., ROGER SAUTERER, AND JAMES RAYBURN. Department of Biology, Jacksonville State University, Jacksonville, AL 36265.-Preliminary analysis of water and sediment extracts from Logan Martin and Guntersville lakes, AL, by the FETAX developmental toxicity assay.

Logan Martin and Guntersville lakes (AL) are artificial lakes that are popular for residential and recreational activities and are facing environmental stress due to high nutrient loads (both lakes) and PCB contamination of sediments (Logan Martin). In order to assess the potential developmental toxicity of lake waters and sediments using a model organism under controlled laboratory conditions, lake waters and sediment extracts from four study sites (one on lake Guntersville, two on Logan Martin lake, and one on PCB-contaminated Choccolocco Creek, which empties into Logan Martin lake) were assayed by the FETAX developmental toxicity assay. The FETAX assay is a standardized assay involving incubation of early gastrula *Xenopus* (frog) embryos in test solutions and examining them for mortality, growth, and malformations at the four-day end point. The preliminary data obtained indicates no statistically significant increases in mortality or malformations and variable effects on embryonic growth at the Logan Martin and Guntersville Lake study sites. The Choccolocco Creek study site showed statistically significant increases in embryonic growth and some non-significant increases in mortality. Additional analysis is in progress in order to further determine the effects of lake water and sediment extracts at these sites.

48. CARTER, LISA A<sup>1,2</sup>., JAMES C. BONNER<sup>2</sup>, AND LISA A. BONNER<sup>1</sup>. <sup>1</sup>Peace College, Raleigh, N.C. 27604 and <sup>2</sup>National Institute of Environmental Health Sciences, Research Triangle Park, N.C. 27709-Mitogen-activated protein (MAP) kinase activation as an indicator of environmental stress in an amphibian cell culture model.

Environmental pollutants that cause cellular stress and cell death may contribute to declining amphibian populations. Many intracellular signal transduction pathways are activated by water pollutants, including reactive oxygen species, bacterial products, and metals. Mitogen-activated protein (MAP) kinases, a family of intracellular signaling molecules, include extracellular signal-regulated kinases (ERK-1 and -2), p38 MAP kinase, and c-Jun N-terminal kinases (JNKs). We used cultured *Xenopus* tadpole cells (XTC-2 cells) to investigate activation of ERK by environmental factors that could stress aquatic ecosystems. XTC-2 cells were exposed to hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), a representative oxidative stressor, or bacterial lipopolysaccharide (LPS), a microbial stressor. A Western blotting technique using antibodies specific for the phosphorylated form of ERK measured ERK activation. Both H<sub>2</sub>O<sub>2</sub> and LPS caused ERK-2 phosphorylation in a time- and concentration-dependent manner. H<sub>2</sub>O<sub>2</sub> caused a 20 to 30-fold increase in ERK-2 activation, while LPS induced a 5 to 10-fold increase in ERK-2 activation. These data suggest that ERK-2 is a target of environmental factors causing oxidative and bacterial stress in frogs. Moreover, the XTC-2 cell culture system may serve as a useful model for assessing the toxicity of polluted waters that could pose a threat to amphibian and human populations.

49. HOYER, ERIK W., TAMMIE BEYERL, MARGARET MINZNER, LISA BRENNAN, AND BETH MIDDLETON. Department of Plant Biology, Southern Illinois University, Carbondale, IL 62911-Functional analysis of planted, regenerated, and old-growth cypress wetlands along the Cache River, Illinois.

A functional analysis was performed upon three wetland sites along the Cache River, Illinois, in an effort to compare two restoration regimes (naturally regenerated vs. planted) to an old growth site. Soil characteristics, canopy and understory vegetation, and primary productivity were assessed in 20 plots along two randomly located transects. The soil of the old growth site

had far greater moisture and organic content than the replanted and regenerated sites (24.8%, 15%, and 12.7% organic matter, respectively,  $F=8.64$ ,  $p<0.003$ ). The old growth site had less dense strands of mature trees than the regenerated or replanted sites (0.05 trees  $m^{-2}$  vs. 8 and 0.133 samplings  $m^{-2}$ ). Production analysis will also be compared between the three sites. Continued monitoring of the regenerated and replanted sites will determine whether, with time, these sites are likely to resemble the old growth site. Our evidence, however, indicates that the regenerated site has more characteristics in common with the old growth forested wetland than the planted site.

50. WRIGHT, KEITH <sup>1,2</sup>, WENDELL R. HAAG<sup>1,3</sup>, LAWRENCE SHAFFER<sup>2</sup>, MELVIN L. WARREN, JR.<sup>3</sup>, AND MARJORIE HOLLAND<sup>1,2</sup>. <sup>1</sup> Biology Department, University of Mississippi, University, MS 38677, <sup>2</sup> University of Mississippi Field Station, Abbeville, MS 38601, and <sup>3</sup>Center for Bottomland Hardwoods Research, USDA Forest Service, Oxford, MS 38655. - Freshwater mussels of the Cypress Creek watershed (Little Tallahatchie drainage): A representative watershed in North Mississippi.

We conducted a survey of the freshwater mussels (Unionidae) at 17 sites in the Cypress Creek watershed (Little Tallahatchie River drainage) in Lafayette County, Mississippi. Mussels were widely distributed in the system, occurring at 15 of 17 sites. Mussel density was generally low, averaging 5.6 live mussels/20 minutes search time, but ranged from 0-19 mussels/20 minutes. We found a total of 14 species (mean number of species per site = 3, range = 1-10). Only three sites supported more than five species. The most widely distributed species was *Lampsilis siliquoidea*, which occurred at nine sites, followed by *Ligumia subrostrata*, *Toxolasma texasensis*, and *Villosa lienosa*, each of which occurred at eight sites. The rayed creekshell, *Anodontoidea radiatus* was found at 3 sites; these populations represent the first known occurrence of this species in the Mississippi River basin. Highest mussel density was found in unchannelized, non-incised stream reaches that flowed through a forested landscape.

51. GRIFFITH, ANGELA M.<sup>1</sup> AND KENNETH G. RICE<sup>2</sup>. <sup>1</sup>Dept. of Biology, Appalachian State University, Boone, NC 28608 and <sup>2</sup>USGS Biological Resource Division, Everglades National Park, Homestead, FL 33034. - Stomach analysis of South Florida alligators, *Alligator mississippiensis*.

This study was undertaken as a pilot study to analyze the consequences of a harsh environment on the diet of the American alligator (*Alligator mississippiensis*) in six different areas of South Florida. Alligator populations were sampled from; Big Cypress National Preserve, Shark Slough - Everglades National Park, Loxahatchee National Wildlife Reserve, Water Conservation Area 2 (WCA2), Water Conservation Area 3A North, and Water Conservation Area 3A South. We analyzed the stomach contents and measured the volume and wet weight for 28 alligators. A comparison of stomach contents among the 6 populations showed that WCA2 had the lowest stomach content volume and wet weight. WCA2 is known for suffering high and low water level distress throughout the year due to man-made-canals. Prey frequency within the 28 stomachs indicated the Apple snail (*Pomacea paludosa*) as the most commonly consumed. Overall, this study reflected a poor qualitative and quantitative diet for these alligators. In part this is due to the impact of human activities.



52. BEVILLE, SHELLEY AND GARY P. SHAFFER. Southeastern Louisiana University, Hammond, LA 70401—The influence of the Amite River Diversion Canal in Southeastern Louisiana on the natural regeneration of baldcypress (*Taxodium distichum* (L.) Rich.): a dendrochronological analysis.

Minimal natural regeneration of baldcypress has been occurring in coastal Louisiana because of subsidence, erosion, altered hydrology, saltwater intrusion, logging, and nutria (*Myocaster coypus*) herbivory. River diversions offer one restoration strategy to rebuild and replenish these wetlands. The focus of this study is to evaluate the influence of an existing freshwater river diversion on the natural regeneration of a dwindling baldcypress-tupelogum swamp in southeast Louisiana. In an attempt to correlate regeneration and growth of cypress with this diversion, a dendrochronological analysis of different size/age classes of cypress trees was conducted. Baldcypress trees of various sizes were randomly chosen at several locations influenced by the Amite River Diversion Canal and two cores per tree were taken for the analysis. In all, results indicate that this freshwater river diversions is beneficial to the swamp system and the majority of regeneration of baldcypress occurred after the diversion was established.

53. FELTEN, J.<sup>1</sup>, W.B. WORTHEN<sup>1</sup>, AND C.B. ANDERSEN<sup>2</sup>. <sup>1</sup>Biology Dept., and <sup>2</sup>Earth and Environmental Sciences Dept., Furman University, Greenville, SC 29613—Biological description of Enoree River (SC) tributaries: Effects of water chemistry and habitat on abundance of *Progomphus obscurus*.

*Progomphus obscurus* is one of the most abundant dragonflies in South Carolina streams. We collected *P. obscurus* larvae from greater than 130 sites in the Enoree River and nine of its tributaries (SC). The river and tributaries differ dramatically in land use patterns, including forests, rural/agricultural areas, residential developments, and industrialized areas. These study sites were sampled once/week in summers 1999 and 2000 for complete chemical descriptions of pH, dissolved oxygen, conductivity, temperature, dissolved cations (Na, Mg, K, Zn, Ca, Fe) and dissolved anions (HCO<sub>3</sub>, Cl, Al, SO<sub>4</sub>, NO<sub>3</sub>, NO<sub>2</sub>, PO<sub>4</sub>, Si, Br). We correlated the abundance of *Progomphus obscurus* with the chemical attributes of these sites using Spearman Rank Correlations. *P. obscurus* abundance correlated positively with bicarbonate, phosphate, and silica levels and negatively between the mean number of fish present per site. We also found that *P. obscurus* abundance was greater in areas with sandy bottoms than rocky bottoms. This research shows that certain chemical, biological, land use patterns and stream composition impact *P. obscurus* and its abundance in most streams.

54. HUNTER, AMY E.<sup>1</sup>, AND SAMUEL P. FAULKNER<sup>2</sup>. <sup>1</sup>Dept. Biological Sciences, University of Alabama, Tuscaloosa, AL 35401 and <sup>2</sup>Dept. Biological Sciences, Delta State University, Cleveland, MS 38733. —Vegetation patterns in sawgrass inlet marshes in Mobile Bay, Alabama: possible effects of natural and anthropogenic hydrologic alteration.

Vegetation patterns were studied at two bay inlet marshes in Mobile County, Alabama. Sawgrass, *Cladium jamaicense*, dominated the understory of both marshes. One marsh supported a sparse tree canopy. Tree age and density at this site, as well as soil physical and chemical parameters at both sites, were assessed. Drummond red maple dominated the tree-covered marsh. Swamp tupelo and pond cypress were minor components. The oldest maples ranged from 1 to 6 years, although most were 4-6 years in age. Soil profiles, pH, and redox measurements were similar at the two sites. Slightly higher water tables occurred at the tree-covered marsh. Tree age correlated well with recent hydrologic disturbances in Mobile Bay and the inlets. Hurricanes in 1979 and 1985 may have temporarily constricted tidal exchange between the bay and the inlet, drying the now wooded wetland sufficiently for tree seedling establishment. Bridge repairs at the wooded site in 1996 and 1997 could have further exacerbated natural hydrologic perturbations. Additional monitoring is needed to understand the long term vegetation and hydrologic patterns of these sites.

55. GOODWILL, THOMAS R., WILLIAM L. SEDDON, AND NATHAN METZ. Frostburg State University, Frostburg, MD 21532.-Effects of manganese ( $Mn^{++}$ ) on the hematology of brook trout (*Salvelinus fontinalis*).

Manganese ( $Mn^{++}$ ) is a toxic heavy metal that appears in streams as a result of acid mine drainage and smelting processes. Previous studies on the effects of  $Mn^{++}$  on fish (*Tilapia sparrmanii*, *Colisa fasciatus*) hematology observed that  $Mn^{++}$  causes decreased erythrocyte counts, anemic conditions, and internal hemorrhaging in fish. The results from these studies were obtained using only one high concentration of  $Mn^{++}$  (i.e. 2800 mg/L) with fish only being exposed to  $Mn^{++}$  for 96-hours. To examine the effects of chronic exposure to low levels of  $Mn^{++}$ , 300 brook trout were exposed to 200 g/L, 400 g/L, 750 g/L, 1250 g/L of  $MnCl_2$ , and a control of moderately hard EPA synthetic water. The fish were acclimated for two weeks and then exposed to  $Mn^{++}$  for a period of eight weeks. After the exposure period, 200-300 L of blood was collected by cardiac puncture for hematocrit, hemoglobin, RBC, WBC, and differential counts. Results showed no significant effects of  $Mn^{++}$  on hematocrit, hemoglobin, RBC, and WBC for all  $Mn^{++}$  concentrations. The only differential component that showed significant effects ( $p = 0.020$ ) were monocytes with only significant effects being observed between the control and the 750 g/L concentration.

56. O'DANIEL, E.<sup>1</sup>, L. FIKES<sup>1</sup>, W.B. WORTHEN<sup>2</sup>, D.C. HANEY<sup>2</sup>, AND C.B. ANDERSEN<sup>3</sup>. <sup>1</sup>Hendrix College, Conway AR 72032, <sup>2</sup>Biology Department, and <sup>3</sup>Earth and Environmental Sciences Department, Furman University, Greenville, SC 29613-Comparison of diversity and abundance of larval odonate populations in rural and urban streams in the Enoree River watershed, SC.

Land use patterns may affect diversity and abundance of stream invertebrates by changing sediment, nutrient and toxin loads. This study examined larval odonate populations found in four tributary streams of the Enoree River, SC. The Brushy Creek watershed is highly urbanized, in the city limits of Greenville, while Kings and Indian Creeks are rural, with forest, rural highways, and cattle pastures dominating the landscape. Durbin Creek has a mixture of urban and rural land use patterns. Odonates were collected using a backpack electrofisher and a 4'x10'x1/8" seine, with 1-2 people kicking the substrate to dislodge animals. Mean odonate abundance and diversity/stream was higher in the Kings Creek, Indian Creek, and Durbin Creek than in Brushy Creek. Particular species of odonates are broadly tolerant of a variety of chemical and physical stresses. However, cumulative effects associated with anthropogenic land use change may alter odonate community structure. As such, rather than focusing on indicator species, community level responses may be a better gauge of the effect of urbanization on the ecological integrity of stream systems.

57. BLAKE, JAMIE<sup>1</sup>, THOMAS JONES<sup>2</sup>, JOHN ENZ<sup>3</sup>, AND DONALD TARTER<sup>1</sup>. <sup>1</sup>Department of Biological Sciences, Marshall University, Huntington, WV, <sup>2</sup>Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV and <sup>3</sup>Department of Biology, Alderson-Broaddus College, Philippi, WV-The benthic communities found downstream from valley fills in southern West Virginia.

A number of permit applications for mountain-top removal within West Virginia prompted the USEPA to develop an Environmental Impact Statement (EIS) prior to release of the permits. That study resulted in the collection of benthic macroinvertebrate samples, water quality, fish community data, and habitat data to be collected from reference and experimental sites. The experimental sites were located downstream from valley fills that ranged in age from current filling to fills that were 30 years old. A subset of the sites included Surber sampling, as well as kick sampling. The samples were collected for four seasons from summer of 1999 to the spring of 2000. Six Surber samples were collected from each site. All macroinvertebrates were identified and enumerated to the lowest possible taxon with the exception of chironomids and oligochaete. The Surber diversity ranged from 5 to 46 taxa. Principle component analysis



(PCA) exhibited strong seasonal and site clustering. Numerous outliers were identified and can be explained using water quality and/or habitat data. Several sites exhibited shifts in community structure especially below the settling ponds. A few pre-reclamations sites exhibited significant structural changes that remained throughout this data set. A general trend to more reference-like community structure was apparent with increasing valley fill age.

58. Adams, Susan B., Melvin L. Warren Jr., AND Wendell R. Haag. USDA Forest Service, Southern Research Station, Oxford, MS 38655. -Temporal variation in the fish assemblages of three Upper Coastal Plain streams in Mississippi.

We found high spatial, seasonal, and in some cases annual variation among fish samples collected bi-monthly between May 1993 and October 1994 in three creeks of the Yazoo Basin in northwestern Mississippi. We sampled 17,962 fish belonging to 51 species and compared various fish assemblage metrics within and among streams during the period. Although assemblages were more similar within streams than within dates, temporal variability in assemblage structure within streams was high. Species turnover was significantly higher in spring/early summer than in late summer through winter. Generally, annual species turnover was lower than turnover during two-month intervals, suggesting an annual return to a similar assemblage. However, sampling was not conducted on the same dates each year, and samples most closely matched for season were not always those most similar in species composition or abundance. For example in Buckhorn Creek, the highest fish abundance per unit effort occurred in August 1994 and was ten times higher than the lowest abundance, occurring in August 1993. We detected no concomitant change in habitat. Extreme variability in assemblages between years has implications for the statistical power of fish monitoring to detect trends in fish assemblages over time.

59. CONNER, AMANDA, M. AND DAVID J. CROWLEY. Biology Department, Mercer University, Macon, GA 31207. -Transcription-coupled repair of ultraviolet light-induced DNA damage in the halophilic archaeon, *Halobacterium sp. NRC-1*.

Archaea are widely studied because of their habitation of extreme environments and their classification as a distinct evolutionary domain. The halophilic archaeon *Halobacterium sp. NRC-1* thrives in solar salt ponds where it is exposed to high levels of ultraviolet radiation. This exposure leads to the formation of cyclobutane pyrimidine dimers (CPDs) in DNA, which arrest replication and transcription and are mutagenic. In both bacteria and eukaryotes, nucleotide excision repair (NER) recognizes these lesions and removes them from the genome. A subpathway of NER, transcription-coupled repair (TCR), couples arrested RNA polymerase complexes with NER proteins to rapidly repair CPDs in actively transcribed genes. TCR has been shown to occur in both bacterial and eukaryotic species, but has not been demonstrated in the Archaea. Our experiments test whether *Halobacterium sp. NRC-1* is able to perform TCR. We measured rates of removal of CPDs from the individual strands of the *rpoB*'B'AC operon through quantified analysis of fluorescently labeled Southern blots. Demonstration of TCR would suggest a novel coupling between the eukaryotic-like RNA polymerase and the bacterial NER homologs present in this species. This work has implications on the mechanisms of TCR and on edifying the evolutionary relationships between the Bacteria, Archaea, and Eukarya.

60. HENSON, BRIAN J., SUSAN R. BARNUM, AND LINDA E. WATSON. Department of Botany, Miami University, Oxford, OH 45056. Evolution of the nitrogen fixation gene *nifD* in heterocystous cyanobacteria.

Diazotrophy, or nitrogen fixation, is the process of converting atmospheric nitrogen ( $N_2$ ) to more reduced forms (e.g. ammonium- $NH_3$ ). Diazotrophy is unique among prokaryotes, however not all prokaryotes have the ability to fix nitrogen. Most cyanobacteria do have this ability, and many genes involved in diazotrophy have been identified within them. The most extensively

studied genes are from the *nifHDK* operon, which is contiguous in most cyanobacteria. However, the heterocystous cyanobacteria have an 11kb insertion element present within the coding region of *nifD*, which is excised by site specific recombination during heterocyst differentiation. It is unclear whether or not all of the heterocystous cyanobacteria genera have the element. The objective of this research is to study the evolution of nitrogen fixation genes by sequencing the *nifD* gene from representatives of the eight core genera of the heterocystous cyanobacteria lineage, and to determine which of these genera have the 11kb insertion element using PCR and Southern blot hybridization.

61. DAVIS, LUCY E. AND DAVID J. CROWLEY. Biology Department, Mercer University, Macon, GA 31207. Role of the *RAD51/recA* homolog *radA* in UV-induced mutagenesis in the extremely halophilic archaeon, *Haloferax volcanii*.

Exposure of cells to ultraviolet light (UV) results in DNA damage, induction of mutations, and cell death. While extensive research on DNA repair and mutagenesis has been conducted with species ranging from bacteria to humans, little is known about these processes in the evolutionary distinct domain of prokaryotes called the Archaea. We are studying *Haloferax volcanii*, an extremely halophilic archaeon, known to possess the ability to repair UV-induced DNA damage. We use the wildtype strain WFD11 and its derivative, DS52, which lacks the *radA* gene, a member of the *RAD51/recA* family of recombinases. By exposing these two strains to UV, survival rates were established for WFD11 and DS52, with DS52 proving more sensitive. UV-induced mutation rates were also studied using the antibiotic novobiocin, which inhibits the replication enzyme gyrase. Cells that experience UV-induced mutations in the gyrase gene do not bind novobiocin, allowing replication to proceed normally and colonies to form on novobiocin plates. The frequency with which mutations to novobiocin resistance arise are, in part, a measure of a cell's repair efficiency. By studying survival and mutation rates in *H. volcanii*, we hope to further elucidate the role of the *radA* gene in promoting cell survival and UV mutagenesis.

62. JONES, MARY D.<sup>1,2</sup>, CHAD C. LOCKLEAR<sup>3</sup>, RICHARD BUCHHOLZ<sup>4</sup>, STEPHEN J. HECHT<sup>5</sup>, AND ANN M. FINDLEY<sup>2</sup>. <sup>1</sup>North Louisiana Criminalistics Laboratory, Shreveport, LA 71101; <sup>2</sup>Dept. of Biology, University of Louisiana at Monroe, Monroe, LA 71209; <sup>3</sup>MWG Biotech, Inc., High Point, NC 27265; <sup>4</sup>Dept. of Biology, University of Mississippi, University, MS 38677; <sup>5</sup>Dept. of Microbiology and Medical Sciences, Grand Valley State University, Allendale, MI 49401. - Production of a MHC Class II Molecular Probe for the Wild Turkey, *Meleagris gallopavo*.

In order to study the genetic basis for parasite resistance in the wild turkey, *Meleagris gallopavo*, a molecular protocol for determining MHC genotypes was established. Development of the species-specific probe utilized in this study yielded the first known MHC sequence information for the wild turkey. Random fragment length polymorphism (RFLP) patterns were generated for three populations of birds utilizing this molecular probe. The procedure for MHC class II probe generation and its use in both wild and commercial turkeys is presented.

63. MILLER, JEREMY R., BRANDON CHAPMAN, JENNIFER HUGHES, JOHN SKAGGS AND C. BRIAN ODOM. Department of Biology, Wingate University, Wingate, NC 28174 - Application of RAPD PCR to identify genetic polymorphisms in the beaver, *Castor canadensis*.

Ten base pair random primers were used in PCR to locate and identify genetic polymorphisms among several specimens of the common beaver, *Castor canadensis*. These techniques show great promise as a means of rapidly identifying such polymorphisms, which can then be used as potential population markers.

64. TUSON, MICHELLE, DANIEL VINES, AND CHRISTI MAGRATH. Dept. of Biological and Environmental Sciences, Troy State University, Troy, AL 36082—Analysis of transcription termination levels from the intergenic regions of Chromosome III in *Saccharomyces cerevisiae*.

To determine the relationship between overlapping autonomous replication sequences (ARSs) and RNA polymerase II transcription terminators, a survey of the transcription termination signals associated with the ARSs located on Chromosome III was completed. The first phase of this investigation was a bioinformational analysis of genomic spacing and orientation of ARS sequences in relation to adjacent genes, as well as a search for the presence of transcription termination consensus sequences within the ARSs. A tendency for ARSs to be positioned in non-divergently arrayed orientations, for ARSs to be located close to the 3'-end of transcribed genes, and for ARSs to contain transcription termination consensus sequences was noted. Based on these observations, the second phase of the investigation involves the analysis of the *in vivo* transcription termination capability of all the ARSs located on Chromosome III, as well as an analysis of the transcription termination potential of all the intergenic regions located on Chromosome III. The data provides evidence on the role of transcription terminators as molecular shields of important intergenic regions, such as ARSs. Support for this project was provided by the Troy State University Foundation, the TSU Department of Biological Science, and the National Science Foundation (CAREER Grant 9985156).

65. BRADLEY, KIANA, LAURI FRAZIER, AND CHRISTI MAGRATH. Dept. of Biological and Environmental Sciences, Troy State University, Troy, AL 36082—Levels of transcription from a galactose inducible promoter correlate with galactose levels in *Saccharomyces cerevisiae*.

The routine utilization of a galactose (GAL) inducible promoter in the model organism *Saccharomyces cerevisiae* traditionally provides only two transcription levels—minimal (off) or maximal (on). To determine if the GAL promoter could be exploited to provide a range of transcriptional levels, we utilized a reporter gene construct primarily used to assess transcription termination levels that contains a galactose promoter upstream of the *LacZ* gene. While varying the concentration of galactose in the growth media, we monitored the production of  $\beta$ -galactosidase in both plate assays and liquid assays. As the amount of galactose in the growth media increased the production of  $\beta$ -galactosidase increased. These results indicate that an expression gradient that correlates with the level of galactose used to induce transcription in the media can be created. This observation will facilitate studies that require gradients of transcriptional levels from a galactose promoter. Support for this project was provided by the Troy State University Foundation, the TSU Department of Biological Science, and the National Science Foundation (CAREER Grant 9985156).

66. MORRIS, MICHAEL W., IRENE KOKKALA, THOMAS H. FOX AND MARK S. DAVIS. Dept. Biology, North Georgia College & State University, Dahlonega, GA 30597—Enhancing field experiences with undergraduate oral presentations.

The Department of Biology at North Georgia College & State University offers several upper-level undergraduate courses with optional corequisite extended field experiences. These courses include plant taxonomy, marine biology, and ecology. The classes travel to Cape San Blas and the Apalachicola National Forest, Florida, Sapelo Island, Georgia, and the Okefenokee Swamp, respectively. Each field trip is enhanced with oral presentations by the participating students. Before the excursions, each student chooses a topic to research for presentation while in the field. The student develops an outline and visual aids to supplement the presentation. Delivery of information is in the form of a "mock" scientific meeting with an *in situ* perspective. The presentation is evaluated by peers and the faculty member using standard criteria established by the class. Feedback from students indicates that this approach benefits their development as educators, as scientists, and as individuals. These field

experience courses are just one part of the overall effort of North Georgia College & State University to enhance both oral and written presentation skills of undergraduate students.

67. RAMP, PAUL AND TERESA FULCHER. Dept. of Natural and Behavioral Sciences, Pellissippi State Technical Community College, Knoxville, TN 37933. - Computer based investigative laboratory experiences for distance learners in biology.

Offering a general biology course in a distance learning format has presented instructors with the problem of providing the students a laboratory experience. To include this experience, instructors have often relied on compromising the course's outreach by having students attend a lab periodically, by investing in materials to be sent individually to students or by relying on the numerous computer based tools which generally offer a 'interactive' narrative of the text material but fall well short of investigative lab experiences. In an effort to fill the need for lab-like experiences for distance learners, we have developed the 'Biology One' CD-ROM series. In addition to subject tutorial, glossary, and self-testing components, the CD series provides students with a series of open ended computer simulations which mimic the laboratory investigations commonly encountered in a traditional course. Assessment of the effectiveness of these simulations have been tested against students in tradition laboratory sections. When students are only exposed to these simulations, their comprehension of the principles investigated were comparable to students in the traditional course. When students received both the computer simulations as well as the traditional laboratory, comprehension increased notable. In addition we found laboratory class time to be more effectively utilized.

68. FIORILLO, RICCARDO<sup>1</sup> AND CHRISTOPHER M. TAYLOR<sup>2</sup>. <sup>1</sup>Division of Natural Sciences, Shorter College, Rome, GA 30165 and <sup>2</sup>Dept. of Biological Sciences, Mississippi State University, Mississippi State, MS 39762. - Effects of size-selective predation on life-history strategy in the western mosquitofish *Gambusia affinis*.

We examined the effects of size-specific predation on life-history traits (age and size at maturity, brood size and mass, mean offspring weight, and reproductive allotment) in *Gambusia affinis* with a mesocosm experiment (June–December 1999). We randomly assigned *G. affinis* fry (2-3 day old) to four treatments: 1) control (no predators) 2) predation on adults (predator: *Lepomis cyanellus*, green sunfish), 3) predation on juveniles (predators: odonate nymphs) and 4) predation on adults and juvenile mosquitofish (predators: green sunfish and odonate nymphs). To prevent predation on experimental *G. affinis*, all predators were maintained in wire mesh cages and fed live field-captured mosquitofish daily. There was no difference in growth rate of *G. affinis* among treatments. However, our data showed a sex-dependent response to predation. Males showed a significant response to potential predation by green sunfish while, overall, female life-history traits did not differ among treatments. Males in treatments that included green sunfish predators delayed maturity and had a greater body size than males from the control and odonate treatments which matured early and at a smaller body size. There were no differences among control and odonate treatments.

69. WEIGANT, PATRICIA L. Peace College, Raleigh, NC 27604 – Morphological variation in *Aletris* (Nartheciaceae) in North America.

Of the 25-37 species of *Aletris* (Nartheciaceae) that occur worldwide, five are native to North America: *A. aurea*, *A. bracteata*, *A. farinosa*, *A. lutea*, and *A. obovata*. Most occur in the Atlantic Coastal Plain, but several species, especially *A. farinosa*, have a wider distribution into the Appalachian Highlands, Interior Highlands, and Interior Plains. *A. bracteata* is disjunct from the other four species, occurring in the everglades of southern Florida, the Florida Keys, and the islands of Andros and Abaco in the Bahamas. The morphological similarity exhibited by the species, combined with the presence of hybrids, introgressants, and forms has resulted in

some taxonomic confusion and misidentification of specimens. This study quantifies the amount of morphological variation present within the genus in North America, based on samples from the entire geographic range, and documents the distribution, based on 2,168 specimens. Least significant difference comparisons and multivariate techniques of cluster analysis and principal components analysis segregate the genus into two morphologically coherent groups: the *aurea-obovata* group and the *lutea-bracteata-farinosa* group. However, all taxa, including *A. lutea* forma *alba*, appear to be appropriate. Aberrant long pedicelled or odd-colored forms are otherwise morphologically indistinct from *A. farinosa*.

70. KARAMAN, VESNA AND L. E. URBATSCH, Louisiana State University, Baton Rouge, LA, 70803. -Phylogenetic analysis of *Boltonia* (Astereae, Asteraceae) based on ETS and ITS sequence data.

The genus *Boltonia* mainly occurs in eastern North America. It comprises five species that grow in moist to wet habitats. In 1994 Nesom suggested a close relationship between *Boltonia* and Old World *Kalimeris*. Subsequently Gu and Hoch provided evidence suggesting that these two genera are not closely allied. DNA sequence data by Noyes and Rieseberg supported *Boltonia*'s close affiliation with New World *Symphyotrichum*, *Batopilasia byei* (as *Erigeron byei*), and genera of Machaerantherinae. In our phylogeny based on ETS and ITS sequence data with *Aster amellus* as the outgroup *Kalimeris* appears basal, while *Boltonia* is the most derived lineage. *Batopilasia* and *Chloracantha* are sisters to *Boltonia* and support Nesom's most recent hypothesis of relationship; *Symphyotrichum* in turn is sister to this clade. Furthermore, our sequence data resolves three clades within *Boltonia* that conflict with current taxonomic hypotheses. *B. asteroides* var. *latisquama*, and *B. asteroides* var. *recognita* are separated from *B. asteroides* and placed in a separate clade together with *B. decurrens* and *B. apalachicolaensis*.

71. LICKEY, EDGAR B., KAREN W. HUGHES, AND RONALD H. PETERSEN. Department of Botany, University of Tennessee, Knoxville, TN 37996 - Phylogeography of *Clavicornia pyxidata* (Homobasidiomycete).

*Clavicornia pyxidata* is a lignicolous, coralloid basidiomycete that is distributed throughout the temperate regions of the Northern Hemisphere. Previous studies have confirmed that wide ranging populations from eastern United States, Sweden, and China are conspecific based on inter-compatibility and enzyme profiles. Recent forays have yielded several collections from Russia, Costa Rica, Mexico, and Utah, all of which have been found to be inter-compatible with previous collections. We analyzed the molecular diversity of this group by sequence and restriction site analysis of the nuclear ribosomal internal transcribed spacer region (ITS 1- 5.8s - ITS 2). A phylogenetic analysis of 12 *C. pyxidata* isolates revealed a broad geographical pattern in which Eurasian isolates make up a clade sister to North American isolates. North American isolates appear to be further sub-divided into northeastern and southwestern clades. A survey of all 255 *C. pyxidata* isolates in our culture collection for restriction enzymes *Bsa* II, *Bsr* I, *Cfo* I, *Eae* I, *Tse* I, and *Xho* I revealed variable restriction sites that follow similar geographical patterns.

72. FARMER, SUSAN B. University of Tennessee, Knoxville, TN 37996- Phylogeographic survey of Trilliaceae.

Trilliaceae are plants of North Temperate forests with a holarctic distribution, and have been proposed to be Arcto-Tertiary in origin. However, there are interesting distribution patterns within the family. In North America only *Trillium* are found, with subg. *Phyllantherum* endemic; in Europe, only *Paris* occurs; but in Asia, representatives of all the genera occur. The center of diversity of *Trillium* is in the southeastern United States; the center of diversity for *Paris s.l.* is in China. Genetically, another distribution pattern develops: polyploidy is restricted to the Old World. All North American *Trillium* are diploid with scattered reports of triploid specimens. Of

the eleven *Trillium* in Asia, only one is diploid; the rest are triploid, tetraploid, or hexaploid. Within *Paris*, the primary European taxon, *Paris quadrifolia* is tetraploid. *Paris incompleta* from the Caucasus Mountains is diploid as are most of the other Asian taxa including all members of *Daiswa*. *Kinugasa japonica* is octoploid. There are high levels of endemism in this family: only one species has a widespread distribution; and one species group exhibits the eastern Asian-eastern U.S. disjunct pattern.

73. WEBER, JOHN S. AND A. JOSEPH POLLARD. Dept. of Biology, Furman University, Greenville, SC 29613—An allozyme study of the endangered aquatic plant *Sagittaria fasciculata*.

*Sagittaria fasciculata*, Bunched Arrowhead, is an emergent aquatic perennial which reproduces almost exclusively by rhizomes and prefers shaded seepage sites. Its current range is limited to one population in Henderson County, NC, and several in Greenville County, SC. Within the last ten years a new population of *S. fasciculata* has colonized an unshaded artificial pond at Furman University, presumably via migration from an established population in an adjacent seepage wetland. The current study focused on genetic and morphological variation in these two populations and another nearby group, also within the Reedy River drainage. The new colony exhibits deviant morphology in significantly longer leaves than in the putative ancestral population. We used cellulose acetate gel electrophoresis to examine allozyme polymorphisms among the populations. Of nine loci successfully resolved with this technique, five were polymorphic in at least some samples. The recently formed pond colony exhibited levels of heterozygosity that were greater than or equal to those found in both of the other populations, and in fact contained several unique alleles. Thus, there is no evidence that this colony is monoclonal or genetically depauperate. Based on our samples, the species seems to harbor considerable genetic variability despite its increasing rarity and fragmentation.

74. DAVID DERAIMO, SHERRINE IBRAHIM, AND JAGAN VALLURI. Division of Biological Sciences, Marshall University, Huntington, WV 25755- Changes in protein patterns in gravistimulated pea stems.

Gravistimulation alters the pattern of cellular growth along the stem resulting in a characteristic upward gravitropic curvature. These changes in cell growth are linked to enzymatic activities in the cell wall which facilitate loosening of the matrix and increase elasticity in growing cells. Analysis of the soluble cell wall and cytoplasmic proteins during gravitropic curvature was investigated in pea stems using SDS-PAGE gels. For protein labeling, 4 seedling shoots were diced into 2 mm pieces and incubated at approximately 23<sup>0</sup> C for 1.5 h in 50 ml of water containing 150 mCi of <sup>35</sup>S-methionine (1100 Ci/mmol; ICN). After labeling, tissue was washed with cold 1mM methionine. Tissue was then homogenized in ice-cold 50 mM Tris-HCl buffer (pH 8.65), containing 20 mM KCl and 10 mM MgCl<sub>2</sub>. The slurry was centrifuged at 13,000 g for 15 min and the supernatant was collected for protein analysis. Incorporation of label into protein was determined by scintillation counting after precipitation in 10% TCA. *In Vivo* synthesized proteins were separated on one-dimensional gels as described by Laemmli. Preliminary analysis of cell wall proteins separated by SDS-PAGE and silver stained revealed 23 extracellular proteins ranging from 10-150 kD in size.

75. IBRAHIM, SHERRINE A., DAVID DERAIMO, AND DR. JAGAN V.VALLURI. Dept. Biological Sciences, Marshall University, Huntington, WV 25755. - Regulation of gene expression in gravistimulated pea stems, *Pisum sativum*.

This project investigates changes in extracellular soluble proteins in pea seedlings, *Pisum sativum*, after changes in orientation to gravity (gravistimulation). Gravistimulation alters the pattern of cellular growth along the stem resulting in a characteristic upward gravitropic curvature. These changes in cell growth are necessarily linked to enzymatic activities in the cell wall, which facilitate loosening of the matrix and increase elasticity in growing cells. Changes in



enzymatic activity and gene expression are crucial for the survival of plants when variations in environmental conditions occur. The major objectives include: (1) analysis of the soluble cell wall and cytoplasmic proteins during gravitropic curvature, and (2) characterization of novel cell wall and cytoplasmic enzymes which respond to a change in orientation to gravity. Pea seedlings are sterilized, rinsed, soaked, planted and allowed to germinate in the dark for at least seven days, and then exposed to dim green light periodically. Cell wall fluid is then extracted from pea stem segments used for biochemical analysis. It is anticipated that changes in the cell wall proteins that are affected by gravistimulation will be identifiable and characterized.

76. MCCOY, JOE-ANN Clemson University, NCSU, Yellow Creek Botanical Institute.—  
Propagation of Threatened Native Medicinal Plants

In recent years much attention has been focused on the loss of genetic diversity as it relates to potential plant medicines from tropical rain forests. Relatively little attention has been given to similar losses in the North American temperate regions. Subsequently there is a large void of accessible research on native North American medicinal plants. Recent expansion of the botanical medicines industry has created an increased pressure on these populations, thus creating a need for the conservation of particular 'at risk' species. Development of cultivation and propagation protocols can provide an alternative source of plant materials. The Southeastern region, with its floral diversity and temperate climate, has a distinct research advantage for the development of propagation data for these 'at risk' species. A current research project is focusing on three native species which are traditionally harvested for their roots and are at potential risk of future extirpation from native habitats. The project is not only focused on propagation research but also on the identification of optimal active ingredient concentrations in various habitats and regional areas. A specific goal is to encourage the production of threatened medicinal plants as profitable alternative crops to area farmers.

77. FRANKLIN, MISTY A. AND JON M. STUCKY. North Carolina State University, Raleigh, NC 27695-7612 -Reproductive ecology of *Lysimachia asperulaefolia*: an examination of seed production in natural populations.

*Lysimachia asperulaefolia* (Rough-Leaved Loosestrife) is a Federally endangered species that is most abundant on fire-managed public lands. It has been hypothesized that prescribed burning affects flowering stem distribution in individual populations and that this distribution in turn, affects pollinator behavior. Since pollinator behavior is directly involved with seed production, it follows that prescribed burning will indirectly affect seed production. This study examines three populations of *Lysimachia asperulaefolia* to develop an understanding of changes in flowering stem distribution, pollinator behavior, and seed production following controlled burning. During the growing season of 2000, background data was collected at research sites. During the growing season of 2001, data will be collected to determine how these factors change following disturbance due to fire. I hypothesize that flowering stem numbers and density will increase, more pollinators will visit flowers, and change in seed production will be related to whether changes in flowering stem density result in increased frequency of compatible flowering stems in populations subjected to fire. Learning how prescribed burning affects factors leading to seed production is an important step toward understanding how to manage the species to produce healthy, stable populations. This work is supported by a grant from the US Forest Service.

78. CONNER, WILLIAM H. AND TOMMY SOCHA. Baruch Institute of Coastal Ecology and Forest Science, Georgetown, SC 29442 and U.S. Army Corps of Engineers, Charleston, SC-The use of native plant species to control erosion on an Intracoastal Waterway spoil bank.

A demonstration planting was initiated on an existing Corps of Engineers disposal area near Carolina Forest, an 18,000-acre site under development near Myrtle Beach, S.C. The slope along the Atlantic Intracoastal Waterway was vegetated with a mixture of kudzu (*Pueraria lobata*) on the upper slope, and (*Phragmites australis*) and three-square grass (*Scirpus olneyi*) on the lower slope. The soils under the kudzu were eroding, apparently from undermining of the toe of the slope by waves and from runoff across the slope. The kudzu was removed and the bank was graded to a three horizontal to one vertical slope. Six categories of plants, including "Grasses above Spring Tide" and "Grasses below Spring Tide" were chosen for planting. The planting scheme was designed following a 4-way ANOVA design, which included factors for species, elevation, fertilization, and polymers. The day after planting began; severe erosion problems resulted following an unexpected rainfall of 30 cm. The project has evolved from one of planting to one of bank stabilization. Methods used to stabilize the bank include the use of erosion mats, hay bales, seeding with grass, and the use of wattling bundles.

79. PÉREZ, HECTOR E. University of Florida, Gainesville, FL 110670—A germination protocol for *Harrisia fragrans* Small ex Britton & Rose (Cactaceae), a federally listed endangered plant in Florida.

*Harrisia fragrans*, a cactus endemic to the Atlantic Coastal Ridge in St. Lucie County, Florida is federally listed endangered plant due to severe habitat loss and fragmentation. Currently it is only known from 11 small disjunct sites in St. Lucie County, Florida. Suitable habitat outside of protected sites is under constant pressure from coastal development. For unknown reasons, increased high mortality and general recruitment failure further threaten existing populations. Reportedly, efforts to germinate seed have failed. Management actions explicitly stated in the recovery plan for this species call for the protection and enhancement of existing populations through identification of germination protocols. Effects of acid scarification, gibberellic acid soaks, constant temperature, hot water baths and combinations on the germination of *Harrisia fragrans* seed were examined. Hot water treatments, alone or in combination with acid scarification were detrimental. Acid scarification for 15 seconds or soaks in 1000ppm gibberellic acid enhanced germination over controls. Germination at constant temperatures of 25, 30 or 35°C was low. Combinations of acid scarification followed by gibberellic acid soaks significantly enhanced germination over controls. A germination protocol for *Harrisia fragrans* has been determined using combinations of acid scarification followed by soaking in 1000ppm GA3.

80. THOMAS, KEENA L..<sup>1</sup>, KELLY E. DOYLE<sup>2</sup>. AND W. DEAN COCKING<sup>3</sup>. <sup>1</sup>Dept. Medicine-Pathology (clinical), University of Virginia, Charlottesville, VA 22908-0214, <sup>2</sup>School of Medicine, Medical College of Virginia, Richmond, VA 23284, <sup>3</sup>Department of Biology, James Madison University, Harrisonburg, VA 22807—Translocation of mercury from Hg contaminated floodplain soils into *Daucus carota*, wild carrot, seedlings under plant growth chamber conditions.

The floodplain of the South River at Waynesboro, VA, has previously been shown to contain significant Hg contamination in the soil from an industrial source. It has also been shown that this Hg enters food chains and is found within tissues of plants and animals within the natural ecosystems at the contaminated sites. In an effort to learn more about uptake by vegetation, seeds of *Daucus carota* collected from the field were germinated and grown in potting soil substrate containing Hg which was collected from a Hg contaminated site and that containing control soil collected from an uncontaminated field site. Atomic absorption spectrophotometry using Hg hydride generation methods demonstrated that Hg was associated with the roots in significant amounts and to a lesser extent translocated into shoot tissues. While tissue concentrations remained relatively constant throughout the seedling growth period, the total amount of Hg per plant increased with age as biomass increased. Both the tissue concentrations, and the total Hg content per plant were reduced when seedlings were grown under experimentally induced water stress.



81. DAVIS, CHRISTOPHER M.<sup>1</sup>, AND DONALD J. DRAPALIK<sup>2</sup>. <sup>1</sup>Dept. of Botany, Miami University, Oxford, OH 45056 and <sup>2</sup>Dept. of Biology, Georgia Southern University, Statesboro, GA 30460--Endomycorrhizal fungi in *Elliottia racemosa*.

Segments of root tips 2 - 3cm long were collected from individuals of *Elliottia racemosa* (Georgia plume) located in Candler County in southeastern Georgia. Soil samples from around the roots were also taken. The roots were cleared and lightened. Some of the roots were then stained using acid fuchsin while others were stained with cotton blue. Approximately 30% of the roots examined showed numerous arbuscules, and a small percentage of the roots also contained vesicles. The soil samples were sieved, then centrifuged in a sucrose solution to isolate fungal spores. One type of spore was predominant: it had a smooth surface, was darkly pigmented and its mean size was 70µm. Another structure at first identified as a spore was later tentatively identified as an accessory cell: it was extra-radicle, small (25µm), warty, and brown. The presence of vesicles and arbuscules places the fungi in the order Glomales.

82. HULL, JAMES C. AND CAROLINE S. GARRETT. Biological Sciences, Towson University, Towson, MD 21252, and Biology, Transylvania University, Lexington, KY 40508--Photosynthetic induction of early and late successional tree seedlings.

We examined photosynthetic inductive light requirements of three tree species representing different successional status. *Ailanthus altissima*, *Liriodendron tulipifera* and *Acer saccharum* seedlings were studied to represent early to late successional species. Seedlings of each species were measured to establish their light response curves and maximum photosynthetic rates. Each species was treated with five photon flux densities (0, 10, 25, 50 and 100 mol m<sup>-2</sup> s<sup>-1</sup>). We measured photosynthetic and stomatal responses of each species-treatment combination to a lightfleck from dark to saturating light. Biochemical versus stomatal control of response was compared between species. *Acer* exhibited a rapid response to a lightfleck indicating a high induction state at low irradiances. Its induction state was more influenced by stomatal conductance than by biochemical limitation. Conversely, early successional species such as *Ailanthus* responded to a lightfleck more slowly demonstrating a lower inductive state and exhibited a larger biochemical limitation to photosynthetic induction. Differences between species in relative photosynthetic rate were less pronounced with increasing treatment irradiance and with duration of the lightfleck.

83. LYTTLE, NIKKI L., FRANK S. GILLIAM, AND CHARLES C. SOMERVILLE. Dept. Biological Sciences, Marshall University, Huntington, WV 25755, USA – Factors influencing spatial variability in soil nitrogen (N) dynamics in N-treated and untreated watersheds of the Fernow Experimental Forest, West Virginia.

Nitrogen (N) saturation is becoming a problem for forests in the eastern United States. Although several watersheds of the Fernow Experimental Forest (FEF) in West Virginia exhibit symptoms of N saturation, most display a high degree of spatial variability in soil N processing. This study examined the effects of temperature on net nitrification in N-saturated soils from FEF, and how these effects varied between high N-processing versus low N-processing soils collected from two watersheds, WS3 (fertilized with (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>) and WS4 (untreated control). Samples of mineral soil were taken from three sub-plots within each of the four plots (WS3/high N, WS3/low N, WS4/high N, WS4/low N). Subsamples of mineral soil were extracted immediately with 1N KCl and analyzed for NH<sub>4</sub><sup>+</sup> and NO<sub>3</sub><sup>-</sup> to determine pre-incubation levels. Remaining soil was incubated at three temperatures: 10, 20, and 30C. Nitrification rates from lab incubations at all temperatures supported earlier observations based on field incubations. At 30C, rates from WS3/high N were three times those of WS3/low N. Highest rates were found for WS4/high N, whereas WS4/low N exhibited no net nitrification. Results support the hypothesis that N additions to WS3 have decreased spatial variability in N processing in mineral soil.

84. BEITING, STEVEN W., AND JOHN L VANKAT. Dept. of Botany, Miami University, Oxford, OH 45056. -Successional dynamics of forests in south-central Alaska.

Old-growth forests in the vicinity of Anchorage, Alaska differ in composition and structure from typical coastal and interior forests and are composed mostly of paper birch (*Betula papyrifera*) and white spruce (*Picea glauca*). Five community types have been described for forests of this region and these appear to be related successionally. We hypothesize three successional sequences and use increment cores from >1000 trees representing all five community types to evaluate successional dynamics.

85. NELMS, MELISSA, ALICIA HIGHSMITH, ERIN VRZAL, AND MARK BASINGER. Dept. Biological and Physical Sciences, Barton College, Wilson, NC 27893—Effect of water depth on plant species composition in emergent marshes in the vicinity of Wiggins Mill Reservoir, Wilson County, North Carolina.

The vegetation of emergent marshes was examined to determine how depth affected composition. Nine random 50-m line transects were established and a m<sup>2</sup> quadrat was sampled within each 5-m interval of each transect. Ninety quadrats were sampled for species composition and cover. Water depth was measured in the center of each quadrat and the presence/absence of water flow was noted. Cluster analysis was used to define four dominance types: edge dominated by *Murdannia keisak* (Asian dayflower), shallow stagnant marsh dominated by *Polygonum hydropiperoides* (water smartweed) and *Ludwigia uruguayensis* (water primrose), deep stagnant marsh dominated by *P. hydropiperoides* and *Alternanthera philoxeroides* (alligator weed), and shallow flowing marsh dominated by *L. uruguayensis*, *P. hydropiperoides*, and *Proserpinaca palustris* (mermaid weed). Water depth ranged from 11.5 cm in the edge marsh, 28.5 cm in the shallow flowing marsh, 32.1 cm in the shallow stagnant marsh, and 63.7 cm in the deep stagnant marsh. Non-native species were dominant or co-dominant in each type identified by cluster analysis and, except for water smartweed and mermaid weed, native species were uncommon in the marsh composition. Species richness was highest in the shallow flowing marsh and lowest in the deep stagnant marsh.

86. BASINGER, MARK A.<sup>1</sup> AND JODY P. SHIMP<sup>2</sup>. <sup>1</sup>Dept. Biological and Physical Sciences, Barton College, Wilson, NC 27893 and <sup>2</sup>Illinois Dept. Natural Resources, Golconda, IL 62938--Status and management of Chinese yam (*Dioscorea oppositifolia* L.) in Illinois.

Chinese yam (*Dioscorea oppositifolia* L.) is a herbaceous perennial vine native to Asia that is currently widely established in 25 states in the eastern half of the U.S. A survey of Illinois during 2000 located 47 populations in 17 counties in the southern one-half of the state. Chinese yam is distinguished from native yam species by the following characteristics: counterclockwise vining, hastate or ovate, opposite leaves, a red-purple blotch at the apex of the petiole-base of the blade, production of aerial tubers called bulbils in the leaf axils, and spikes of white flowers that have a cinnamon fragrance. The vines form dense thickets and are most common at old homesites, along fencerows, along roadsides, and in alluvial soil of creeks, streams, and rivers. This species is not known to reproduce sexually in the U.S. and reproduction appears to be limited to the asexual bulbils. A 3% Garlon solution was superior to a 10% Scythe solution in preventing bulbil germination and growth. However, neither herbicide provided 100% effectiveness, so repeated applications are necessary to control this species.

87. SLAPCINSKY, JODI L.<sup>1</sup>, DORIA R. GORDON<sup>1</sup>, GREG S. SEAMON<sup>2</sup> AND BEATRIZ PACE<sup>3</sup>. <sup>1</sup>The Nature Conservancy, P.O. Box 118526, Gainesville, Florida 32611, <sup>2</sup>The Nature Conservancy, P.O. Box 393, Bristol, FL 32321, and <sup>3</sup>The Nature Conservancy, 222 E. Stuart Avenue, Lake Wales, Florida 33853—

"Restoration of structure and composition of a degraded sandhill community with fire at Apalachicola Bluffs and Ravines Preserve, Liberty County, Florida.

Efforts are underway to restore the structure and composition of a degraded sandhill community with fire in The Apalachicola Bluffs and Ravines Preserve, a The Nature Conservancy owned and managed preserve in Liberty County, Florida. Prior to TNC ownership, most of the uplands were cleared, windrowed and planted in off-site slash pine plantations. Our approach is to use an on-site, non-silvicultural unit that has been fire-managed to serve as a target for longleaf pine community restoration on the windrowed sites and to fire-manage the comparison sites so they more closely resemble the target site over time after successive burns. The variables presently measured are 1) size structure and density of longleaf pine, 2) the percent cover and number of hardwoods and off-site pines greater than 1 m tall, 3) density of hardwood seedlings, and 4) percent understory cover of perennial graminoids, litter, bare ground, and other plants less than 1 m tall. After 1 to 2 fires most of the variables of the restoration sites are progressing toward the target site.

88. MAYRHOFER, MARIA, ZACK E. MURRELL, and RAY S. WILLIAMS. Appalachian State University-Demography and reproductive ecology of the imperiled Heller's Blazing Star.

*Liatris helleri* (Porter) Porter persists in eight populations in the Northern Peaks of the Southern Appalachians. Our study centered on a population along the Blue Ridge Parkway that is being impacted by human recreation. We developed a monitoring strategy to provide long-term analysis of population health. To augment this analysis, we counted vegetative and flowering stems at a second site that had been previously burned. A second aspect of the study involved an examination of pollinators at three sites, where we examined pollinator diversity, and movement of pollinators on and between the flowering stems. A third aspect of the study involved a controlled pollination study where flowering heads were bagged and manipulated. Our results did not confirm earlier studies suggesting that the plant is an obligate outcrosser. Pollinators appear to be impacted by local weather conditions. The plant does not have a high seed set and the lower flowering heads seem particularly susceptible to weather conditions at the end of the growing season. Efforts in the past have focused on plantings of new individuals into extant population; our results indicate a need for a more detailed examination of the biology of the species.

89. SMAW, SHERCODA, LAFAYETTE FREDERICK, AND RAYMOND L. PETERSEN. Biology Department, Howard University, Washington, D.C. 20059. - The urban moss *Bryum capillare* Hedw.: cyanobacterial and algal associates as biogenic crusts.

*Bryum capillare* Hedw. is a cosmopolitan moss ubiquitous in cities, where it occurs as a dense-green velvet growths between the cracks in sidewalks. We report on the cyanobacterial and algal associates of *B. capillare* and the role they have in building biogenic crusts. Individual plantlets of *B. capillare* are cultured on 1/5 strength Hoagland's 1% agar medium. After five days a variety of cyanobacteria and algae are observed growing out from *B. capillare* implants. Some of the more abundant cyanobacterial taxa observed are: *Lyngbya* sp., *Calothrix* sp., *Oscillatoria* sp. *Phormidium* sp., *Hydrocoleum homeotrichum*, *Anabaena* sp., *Anabaena circinalis*, *Synechocystis aquatilis*, *Schizothrix* sp., and *Polycystis* sp. Eukaryotic algae observed are: *Klebsormidium* sp., *Ulothrix* sp., and an unidentified diatom. Most of these cyanobacteria and algae are filamentous. This morphology probably adds a textile-like resiliency to the biogenic crust. Based on these observations it is hypothesized that the laying down of a cyanobacterial/algal mat is a prerequisite for *B. capillare* colony growth. This suggestion is supported by the field observation of a biogenic crust of cyanobacteria and algae subtending *B. capillare* colonies. This study is ongoing and should have applications to moss ecology and processes of primary succession.

90. PRICE, CHUCK AND JAKE WELTZIN University of Tennessee, Knoxville, TN 37920—The efficacy of prairie restoration in Cades Cove, Smoky Mountains National Park.

Cades Cove, a cultural management zone in the Great Smoky Mountain National Park, has been managed to reflect an earlier time period in the Cove's history. Large tracts were committed to hay growing or cattle grazing. As the park reclaims these pastures, an effort is underway to restore many of the native grasses that were once more abundant. Currently, non-native species such as fescue (*Festuca pratensis*) and other common, non-native grasses dominate many of the old pastures. To decrease the dominance of these and other non-native species, the Park Service has initiated a series of herbicide applications and native seed plantings on a number of treatment plots within the Cove. The goal of our research was to assess the relative success of those treatments in 1) decreasing invasive plant species, and 2) increasing desirable native plant species. Our objective was to examine the frequency and foliar cover and biomass of a representative group of dominant species.

91. WARRINER, MICHAEL D. AND T. EVAN NEBEKER. Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS 39762.—Ground beetles (Coleoptera: Carabidae) in greentree reservoirs and naturally flooded bottomland hardwood forests.

The bottomland hardwood forests of the southeast represent one of the most altered and threatened ecosystems in the continental United States. Remaining stands of this forest type are known to provide important habitat for a wide range of species. Conservation of this biotic diversity will have to be balanced with the strong economic and societal pressures that exist for utilization of this resource. Greentree reservoirs (GTR's) are bottomland hardwood stands that are impounded and flooded annually to provided habitat for migrating waterfowl. What impact this practice has upon native bottomland fauna, other than waterfowl and their food (aquatic invertebrates), is relatively unknown. Terrestrial insects represent a dominant component of most bottomland hardwood forests yet they have rarely been considered in light of their response to forest management. Over the course of 2000 we collected ground beetles (Coleoptera: Carabidae) from GTR's and naturally flooded bottomland hardwood stands. Results regarding diversity, abundance, and faunal similarities will be discussed in light of the habitat characteristics of both GTR's and naturally flooded stands.

92. Introduction to Symposia and Workshops: see page 50.

93. BIANCHI, THOMAS<sup>1</sup>, S., MARTHA SUTULA<sup>1</sup>, AND BRENT A. MCKEE<sup>2</sup>. <sup>1</sup>Dept. of Ecology and Evolution, Institute for Earth and Ecosystem Sciences, Tulane University, New Orleans, LA 70118 and <sup>2</sup>Dept. of Geology, Institute for Earth and Ecosystem Sciences, Tulane University, New Orleans, LA 70118. - Seasonal storage of sediments and carbon cycling the lower Mississippi River.

Presently, only about 10% of the sediments eroded from land are being discharged directly to the oceans by rivers, while the bulk of particulate terrestrial materials is being stored somewhere within the river system--between the uplands and the sea (Meade et al., 1990). Seasonal sediment storage and remobilization have been documented in rivers where deposition to the riverbed occurs during low discharge and resuspension during high discharge. We examined transformations and sources of suspended and bottom sediment carbon in the lower Mississippi River as a result of seasonal changes in discharge, storage, and diagenesis. Samples were collected during five cruises over one year at two sites in the lower river. No strong variation in concentrations of carbon from surface to bottom, or along longitudinal axis of river were observed. Seasonal changes in dissolved organic carbon (DOC) porewater profiles are consistent with diagenesis occurring during low-flow storage after period of high-flow deposition. Particulate organic carbon (POC) showed significantly greater range in concentrations than DOC. Based on lignin-phenols, much of the terrestrially-derived POC that settled to these sediments was derived from non-woody and woody angiosperms. Conversely,

based on plant pigment composition, much of the phytoplankton-derived POC was from diatoms.

94. RABALAIS, NANCY N. Louisiana Universities Marine Consortium, Chauvin, LA 70344. - Hypoxia in the Gulf of Mexico and Linkages with the Mississippi River.

A large zone of oxygen-depleted water extends across the Louisiana continental shelf and on to the Texas coast most summers. The Gulf of Mexico hypoxic zone is the largest such zone in coastal waters of the Western Hemisphere, reaching up to 20,000 km<sup>2</sup> in mid-summer. Hypoxia occurs from late February through early October and nearly continuously from mid-May through mid-September. Hypoxic waters can include 20 to 80% of the water profile between 5 and 30 m water depth, and can extend as far as 130 km offshore. Gulf hypoxia results from the stratification of marine waters due to Mississippi River system freshwater inflow and the decomposition of organic matter stimulated by Mississippi River nutrients. Strong empirical relationships are evident for hypoxia versus river discharge and nutrient flux with time and spatial lags. Hypoxia was first recorded on the continental shelf of the northern Gulf of Mexico in the early 1970s. Prior to the 1970s, there is only scattered anecdotal data. Analysis of the sediment record, however, shows that severe hypoxia is a recent development in Gulf waters and coincident with the tripling of nitrogen flux from the Mississippi River.

95. DORTCH, QUAY. Louisiana Universities Marine Consortium, 8124 Highway 56, Cocodrie, LA 70344. Harmful algal blooms in Louisiana coastal waters: a result of eutrophication and a threat to human and ecosystem health

A wide variety of Harmful Algal Blooms (HABs) occur in Louisiana coastal waters with impacts that may include 1) human illness due to consumption of contaminated fish and shellfish or exposure to toxins by other mechanisms, 2) mortality of fish, shellfish, and other wildlife, 3) ecosystems changes due to altered species composition, and 4) aesthetic problems with the appearance, smell, and taste of water. Nutrient inputs have increased substantially to both estuaries and the continental shelf, especially due to changes in the Mississippi River since the 1950's. While it is not possible to determine the role of increased nutrients in the occurrence of some HABs, the two most pervasive and persistent HABs in this region, *Pseudo-nitzschia* spp. and *Anabena* spp., are directly stimulated by inputs of high nutrient Mississippi River water. *Anabena* spp. cause discoloration of water and foul odors over wide areas in low salinity regions and sometimes produce heptatotoxins. *Pseudo-nitzschia* spp. can produce domoic acid, a neurotoxin, and are a dominant species at higher salinities in estuaries and on the shelf. There is some concern that when Mississippi River water is used in freshwater diversions for wetland restoration, blooms of these species may increase.

96. SHAFFER, GARY P.<sup>1</sup>, AND JAMES. G. GOSSELINK<sup>2</sup>. <sup>1</sup>Dept. Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 and Center for Wetlands Resources, Louisiana State University, Baton Rouge, LA 70803-Characterization, degradation, and restoration of the Mississippi River alluvial plain.

The Mississippi River Alluvial Plain originates in southern Illinois and extends over 1000 km through Missouri, Kentucky, Tennessee, Arkansas, Mississippi, and Louisiana. The floodplain historically supported the largest expanse of forested wetlands in the USA, approximately 8.6 million ha, 80% of which has been converted primarily to production of cotton, corn, and soybeans. Over 95% of the remaining floodplain wetlands are located in Louisiana. During the last decade, The Nature Conservancy has spearheaded a restoration program that (1) brought together a network of partners, including state and federal agencies, private landowners, conservation groups, academicians, and other interested citizens; (2) developed a geographic information system for the entire floodplain; and (3) for one watershed, the Tensas basin in northeastern Louisiana, constructed a high-resolution GIS to demonstrate the feasibility of a

semi-objective, landscape-scale restoration planning procedure, including methodology for prioritization of existing wetland forest patches and areas most suitable for reforestation and connection via corridors. Additional strategies involve restoration of the natural hydrologic regime in key areas, development of secondary buffer zones around core conservation areas, and management of uplands essential to watershed functions.

97. REED, DENISE, J. Dept. Geology & Geophysics, University of New Orleans, New Orleans, LA 70148. -- Using the Mississippi to Restore Coastal Louisiana: the greatest opportunity and the greatest challenge

Decades of research on the underlying causes of coastal land loss in Louisiana have led to a new concerted effort to utilize the resources presented by the Mississippi to the maximum extent practicable. A sustainable deltaic plain, with all the associated ecosystem goods and services, must be connected to the river. However, infrastructure development, as well as human expectations of the renewable resource base, mean that re-establishing such connections is both a costly and difficult process which results in changes that, although making the ecosystem more sustainable, are not always what people want or expect. The Coast 2050 plan for Louisiana calls for the diversion and management of Mississippi River water on an unprecedented scale. While ongoing planning efforts have resolved, or at least elucidated, many of the physical and economic obstacles to river diversions (e.g., increased dredging costs and the need for an integrated 'oyster relocation' program), substantial debate surrounds ecological implications and the effect on other harvestable species. The trade-off facing planners and policy-makers in coastal Louisiana is whether to wait for better resolution of technical issues while allowing continuing degradation of the system, or to move on in an adaptive management context knowing that controversy lies ahead.

98. TWILLEY, ROBERT R. AND VICTOR RIVERA-MONROY. Center for Ecology and Environmental Technology, University of Louisiana at Lafayette, Lafayette, LA 70504. - Developing Conceptual Models of Coastal Wetland Restoration in River Dominated Environments

Restoration ecology is predicated on understanding how physical and biological factors control succession of ecosystems. A fundamental need of restoration ecology is general systems theory leading to development of protocols that can be used to diagnose problems and prescribe specific site criteria to design a rehabilitated ecosystem. Approaches to coastal wetland rehabilitation lack conceptual and simulation models that couple the relative influence of geomorphological and ecological factors that control successional trajectories. River dominated wetlands are strongly influenced by geophysical processes; whereas many models of plant succession are based mainly on ecological processes. Destabilization of marsh sediments in deltaic environments has been historically related to chronic waterlogging stress and lack of riverine sediments. Yet marsh damage during the recent severe drought in the Mississippi River delta suggests that water deficits can also destabilize inland marsh habitats. Thus the relative role of freshwater and sediments is confusing. Coastal wetland succession is described using freshwater diversion projects as a method to reverse wetland loss in this deltaic environmental setting. Levees and dams have been instrumental in the decline of floodplain wetlands in many river-dominated coastal areas around the world. Operational standards for freshwater diversion structures require improved models of coastal wetland succession to mitigate against potential problems with downstream eutrophication. Pulsed geophysical events that deliver sediment can be used to provide successional trajectories of wetland processes. Models of coastal wetland succession must couple geophysical, hydrographic, and biogeochemical processes to assist in the design of rehabilitation projects in deltaic environments.



99. LHOTKA, JOHN M. AND JAMES J. ZACZEK. Southern Illinois University, Carbondale, Illinois 62901-The enhancement of oak regeneration through the use of mechanical incorporation of acorns in a mixed-oak upland forest in southern Illinois.

The purpose of the study is to investigate whether mechanical incorporation of acorns can be used to increase the density of oak regeneration in a mixed-oak stand. The study area is 7.3-hectare mixed-oak stand dominated in the overstory by *Quercus alba* and *Quercus velutina*. The stand's midstory is composed primarily of a thick canopy of *Acer saccharum*. The understory vegetation is sparse and contains little to no oak regeneration. In October 1999, the incorporation treatment was accomplished by using a John Deere 550 crawler tractor with a six-tooth brush rake. The low intensity soil disturbance treatment is designed to increase oak seedling germination and survival by incorporating the acorns into the upper soil horizon. One growing season after incorporation, the stand had significantly higher numbers of oak seedlings in the incorporated plots (5,164/ha) than in the control plots (1,273/ha). This suggests that in the presence of abundant acorns, mechanical incorporation of acorns may increase the likelihood of new oak seedling recruitment. Finally, because incorporation may increase the density of oak seedlings, it will help enhance the probability that a mixed-oak stand can be successfully regenerated after a disturbance.

100. SHARMA, G. K. AND DEBORAH A. DAVIS. Dept. Biological Sciences, University of Tennessee at Martin, Martin, TN 38238-Adaptations in leaf morphology and cuticular dynamics in *Parthenocissus quinquefolia* L. in response to environmental pollution.

Four populations of *Parthenocissus quinquefolia* L. (Virginia Creeper) growing in the mid-southern part of the United States were studied to determine the relationship between environmental pollution and leaf morphology and leaf cuticular dynamics. There was a decrease in the length and width of central leaflet, petiole length, and number of teeth on the margin of the central leaflet in plants of the polluted habitats. In addition, stomatal frequency values, size of the largest stoma, and the epidermal wall undulations exhibited a decrease in polluted habitats. Furthermore, trichome length and trichome frequency increased in polluted habitats. Subsidiary cell complex remained the same in all the four plant populations suggesting its taxonomic significance for the species.

101. HERBERT, BRANDON T. AND FRANK P. DAY. Dept. Biological Sciences, Old Dominion University, Norfolk, VA 23529-Triphenyl-tetrazolium chloride as an indicator of root vitality in a scrub-oak ecosystem in central Florida: implications for minirhizotron technology.

Minirhizotron images are assigned color codes to approximate the age of individual roots *in situ*. Root color classification is usually confined to white, brown or black. Triphenyl-tetrazolium chloride (TTC) has been used to measure the vitality of plant tissue by detecting dehydrogenase activity. TTC was used to assess the vitality of root tissue by color in a scrub-oak ecosystem at Kennedy Space Center in central Florida. Roots were excavated and sorted into four color classes: white, light brown, dark brown, and black. Root samples of each color class were stained with TTC. The product of the reduction of TTC by dehydrogenase enzyme, formazan, was extracted and its absorbance recorded using a spectrophotometer. A significant difference ( $p < 0.05$ ) in absorbance was observed between all color classes. This suggests that root vitality can be measured indirectly by root color through the use of minirhizotron images, and that the current color classification should be expanded to provide higher resolution in identifying the level of root activity.

102. DRAKE, SARA J.<sup>1</sup>, JAKE F. WELTZIN<sup>1</sup> AND PATRICIA D. PARR<sup>2</sup>. <sup>1</sup>Department of Ecology and Evolutionary Biology, The University of Tennessee, Knoxville, TN 37996 and <sup>2</sup>Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831. —Assessment of non-native invasive plants on the National Environmental Research Park at Oak Ridge National Laboratory.

The National Environmental Research Park at Oak Ridge National Laboratory, Oak Ridge, Tennessee is composed of second-growth forest stands characteristic of much of the eastern deciduous forest of the Ridge and Valley Province of Tennessee. Human use of natural ecosystems in this region has facilitated the establishment of at least 167 non-native, invasive plant species on the Research Park. Our objective was to assess the distribution, abundance, impact, and potential for control of the 18 most abundant invasive species on the Research Park. We conducted field surveys of 16 natural areas, and the Research Park as a whole, to acquire qualitative and quantitative data. Data from the survey were used to rank the relative importance of these species using the "Alien Plant Ranking System" published by the US Geological Survey. Results indicated that Japanese grass (*Microstegium vimineum*) is the most widespread invasive plant on the Research Park, and that it is most problematic, in terms of its likely impact on native communities, in 12 of the 16 natural areas surveyed. Japanese honeysuckle (*Lonicera japonica*) and kudzu (*Pueraria lobata*) were the second and third-most problematic plant species on the Research Park.

103. STALTER, RICHARD AND ERIC E. LAMONT. Department of Biological Sciences, St. John's University, Jamaica, New York 11439 - The vascular flora of Jamaica Bay Wildlife Refuge, New York.

Jamaica Bay Wildlife Refuge, comprising 3,705 hectares, is part of Gateway National Recreation Area, New York. A significant aspect of the refuge is that it is not a natural landscape. Preliminary results indicate that vascular flora consists of 330 species in 208 genera in 77 families. The largest families in flora are the Asteraceae (52 species) and Poaceae (52 species). The largest genera are Panicum (8 species) and Polygonum (7 species). Native species, 57.6 percent of the flora, are a major component of the natural vegetation.

104. DAY, FRANK P., JOHN J. DILUSTRO, AND BRANDON T. HERBERT. Dept. Biological Sciences, Old Dominion University, Norfolk, VA 23529-Response of roots to more than 4 years of exposure to elevated atmospheric CO<sub>2</sub> in an oak-scrub ecosystem in central Florida.

High levels of atmospheric CO<sub>2</sub> have been observed to have a fertilization effect on above and belowground growth of plants. A persistent question associated with these observations is "what is the duration of these responses?" We have investigated the effects of elevated carbon dioxide on fine root growth using open top chambers with both ambient and elevated (700 ppm) CO<sub>2</sub> treatments in an oak-palmetto scrub ecosystem at Kennedy Space Center, Florida for over 4 years now. Minirhizotron tubes were installed in each elevated and control chamber to allow observation of roots. Each tube was sampled for root length density (mm cm<sup>-2</sup>) every three months. Carbon dioxide enrichment of the chambers began May 15, 1996. By December 1998 root length density (RLD) increased to 19.1 mm cm<sup>-2</sup> for the control chambers and 37.7 mm cm<sup>-2</sup> for the enriched chambers in the top 101-cm of soil. These increases in fine root proliferation have continued for more than 4 years, indicating a relatively prolonged response. The increased rates of fine root growth suggest a potential increased rate of carbon input into the soil.



105. SCHMALZER, PAUL A.<sup>1</sup> AND F.W. ADRIAN<sup>2</sup>. <sup>1</sup>Dynamac Corporation, DYN-2, Kennedy Space Center, FL 32899, and <sup>2</sup>Merritt Island National Wildlife Refuge, P.O. Box 6504, Titusville, FL 32782-Survival and growth of scrub oaks and saw palmetto planted in a former agricultural site.

Scrub vegetation reestablishes poorly where it has been eliminated. In a pilot project, scrub oaks, saw palmetto, and other species were planted in a 5.6 ha former citrus grove on scrub soil adjacent to extant scrub. Oaks, 1-year-old tublings, (*Q. chapmanii*, *Q. geminata*, *Q. myrtifolia*) were planted in the summer of 1992 with a second planting in the summer of 1993. *Serenoa repens* and other species (1-gallon pots) were planted in the summer of 1993. We marked 150 oaks from the first planting, 50 from the second, and 34 saw palmetto. We relocated these plants annually and determined survival and height growth. Mortality of oaks was concentrated in the first year. Survival and growth of *Q. geminata* were significantly greater than *Q. chapmanii*/*Q. myrtifolia*. By 1999, of the first cohort 65.6% *Q. geminata* but only 16.7% *Q. chapmanii*/*Q. myrtifolia* survived. Mean heights were *Q. geminata*- 309.6 cm (n=63), *Q. myrtifolia*- 179.5 cm (n=4), and *Q. chapmanii*- 79.4 cm (n=5) in 1999. Survival was lower but species differences similar in the second cohort of oaks. Initial survival of *Serenoa* was high (100%) but declined (58.8%) due to rooting by feral hogs. *Serenoa* grew slowly; mean height= 65.6 cm (n=20) in 1999.

106. HEYEL, SUSAN M. AND FRANK P. DAY. Dept. of Biological Sciences, Old Dominion University, Norfolk, VA 23529. -Long term residual effects of nitrogen addition on a barrier island dune ecosystem.

A nitrogen addition experiment was conducted on a dune ecosystem at the Virginia Coast Reserve Long Term Ecological Research Site in 1991. The purpose of the current study was to determine whether residual effects of the nitrogen addition nine years ago were still observable and if so, where the sinks of residual nitrogen are located. Nine years after the application, aboveground biomass in the fertilized plots was observed to be significantly ( $P < 0.05$ ) greater than in control plots. However, current aboveground biomass estimates indicate that there has been a significant ( $P < 0.05$ ) decrease in biomass in both control and fertilized plots over a nine-year period. This suggests that nitrogen added nine years ago remains and has continued cycling in a system noted for high nutrient leaching rates, but other factors must have depressed biomass production on all three dunes over the past decade. Research in progress will determine belowground biomass patterns and establish the location of nitrogen sinks seasonally.

107. FRANCKO, DAVID A. Department of Botany, Miami University, Oxford, OH 45056 Palm cultivation in SW Ohio: Quantitative assessment of winter damage, mortality, and recovery.

Over 100 specimens of cold-hardy palms (*Rhapidophyllum hystrix*, *Trachycarpus fortunei*, *T. takil*, *Sabal minor*, *S. minor* var. 'Louisiana', *S. palmetto*, *S. bermudana*, *Serenoa repens*, *Livistona chinensis*, *Washingtonia robusta*, *Butia capitata*) are currently being cultivated in USDA Zone 6a - 7a microclimate plots on the Miami campus and in rural gardens. Palm survivorship, leaf and stem damage, and subsequent growing season recovery and growth were quantified through the winter of 1999-00 and the 2000 growing season. Using leaf-damage index, I tested the hypothesis that the cold temperature tolerance range for marginally cold-hardy palms could be extended significantly via cultural techniques and acclimation. Winter minimum temperatures ranged from -12 degrees F in the coldest plots to 0 degrees F in the warmest plots. Survivorship in the above species approached 100%, and leaf/stem damage ranged from slight (minor margin burn in *R. hystrix*) to significant (*Sabal* and *Trachycarpus* sp.) to complete defoliation (*W. robusta*, *B. capitata*, *L. chinensis*). Foliar recovery in all surviving palms was noted by late spring, and by mid-summer plants most palms exhibited significantly net growth compared with the end of the previous growing season. These data establish new and much lower cold tolerance limits for several palm species.

108. WANG, WEI. Department of Biology, University of Memphis, Memphis, TN 38152-  
Acorn loss and seedling establishment in Liaodong oak (*Quercus liaotungensis*  
Koidz.) in Dongling Mountain, Northern China.

Acorn loss and seedling establishment of Liaodong oak (*Quercus liaotungensis* Koidz.) were examined in three forests in Dongling Mountain, Northern China. It was a mast year for the oak in the broad-leaved forest, but a non-mast year in the Chinese Pine forest or the Prince Rupprecht's Larch forest in 1998. The acorn losses due to predation by the vertebrates are high for the two conifer forests in both the peak of acorn fall and after acorn fall. All the acorns placed on the ground in both conifer forests were eaten *in situ* or removed by the second day. In broad-leaved forest, however, acorn loss was high after acorn fall, but low during the peak of acorn fall, perhaps due to predator satiation. In fall 1999, the seedling density in the broad-leaved forest was 912.5 stems/ha, much greater than in the Chinese Pine forest and Prince Rupprecht's Larch forest, which were 6.25 stems/ha and 37.5 stems/ha, respectively. The surprisingly low seedling densities in the two conifer forests were perhaps due to the low density of acorn-producing trees, high acorn predation by vertebrates, and high retrieval rate of the buried acorns by vertebrates. The results suggest that the lower predation pressure on acorns in the broad-leaved forest resulted in a higher rate of seedling establishment than in conifer forests which have high predation pressure.

109. WALLY, ALAA L. Archbold Biological Station, 123 Main Drive, Venus, FL 33960—Challenges of conserving a critically endangered pitcher plant.

*Sarracenia jonesii* is a carnivorous perennial endemic to isolated acid bogs and rock outcrop seeps of the North and South Carolina mountains. NC retains three native sites (26% of historical records) and SC retains eight (80%). The NC Plant Conservation Program established two additional sites in 1997 using propagules from an extirpated population. All populations have been monitored for 2 to 9 years and several have been the subject of management and research. These projects suggest that population decline has been buffered by the plant's perennial habit, but that many sites are now threatened by processes fostering slow decline (woody establishment, exotic invasion, silt, nutrient, and chemical inputs) or by unpredictable events (flood, drought, trampling, poaching). Recruitment of new individuals is limited species-wide. Restoration attempts (chiefly clipping vegetation and manipulating hydrology) are often unsuccessful and may not adequately address fundamental mechanisms of habitat erosion. Identifying specific and appropriate management techniques has proved difficult because a suite of ecological and anthropogenic processes appear to be interacting at each site. Although work is hampered by the extreme rarity and vulnerability of the sites, conservation success will continue to be limited without a better understanding of population and community responses to manipulation.

110. HELD, MICHAEL E.<sup>1</sup> AND SUSAN JONES-HELD<sup>2</sup>. <sup>1</sup>Saint Peter's College, Jersey City, NJ 07306 and <sup>2</sup>King's College, Wilkes-Barre, PA 18711—A re-examination of the forest community at Hickory Run State Park, Carbon County, Pennsylvania

In 1987 and 2000 the forest community at Hickory Run State Park, Carbon County, Pennsylvania was surveyed. In both surveys the forest community was dominated by *Acer rubrum* and *Fagus grandifolia*. In 1987 the subdominants were *Betula* sp. and *Tsuga canadensis*, whereas in 2000, the subdominants were *Quercus alba* and *Q. prinus*. Between 1987 and 2000 the percentage of *Acer rubrum* stems classed as canopy trees [ $\geq 30$  cm DBH] increased from 18 to 36% whereas the value for *Fagus grandifolia* declined from 18 to 13% indicating a subtle shift in community structure. In 1987 we proposed that there would be a shift to a beech dominated forest based on the understory data. However, in the 2000 survey, we have observed that over 60% of the tree-size beech were infected to some degree with the beech bark disease, which was not observed in the previous survey. We plan to continue to monitor this site to document the effects of this disease on the forest community.

111. RUSSELL, COLIN A., BRENDAN T. LUCEY, AND LESLIE A. REAL. Department of Biology, Emory University, Atlanta, GA 30322. –Spatial dynamics of dogwood anthracnose in the eastern United States.

Dogwood anthracnose poses a potentially lethal threat to *Cornus florida* populations in the eastern United States. Since its initial outbreak in the northeastern US, dogwood anthracnose has spread southward now occurring in 20 states along the eastern seaboard. We analyzed US Forest Service records of the year of first appearance of this disease in 240 counties within the southeastern US. We used Point Kriging and Trend Surface Analysis to statistically characterize the structure of epidemic spread. Vector field analysis of the pattern of spread indicates a statistically significant association between high elevation and the high rates of local propagation. Approximately 14% of the variation in local rates of propagation is attributable to variation in elevation (df = 244,  $p < .0001$ ). The correlation between disease incidence and elevation has been suggested in the literature. However, this is the first quantitative assessment of the variation in the velocity of epidemic spread and an important environmental variable. The data also indicate that propagation may be more rapid than initially suspected. Spatial interpolation suggests that the disease may be occurring in areas that are currently not reporting infection. Spatial interpolation can be used as a powerful tool to guide appropriate surveillance strategies.

112. FLAGG, RAYMOND O.<sup>1</sup>, AND GERALD L. SMITH<sup>2</sup>. <sup>1</sup>Carolina Biological Supply Company, Burlington NC 27215-3398 and <sup>2</sup>High Point University, High Point NC 27262-3598 -- Characters and distributions of *Zephyranthes* species in the USA.

There are 14 species of *Zephyranthes* found in the USA: 11 native and 3 naturalized. Clusters of floral characters and some leaf morphology distinguish species. Primary floral characters are: type of stigma, spatial relationships of stamens, the fraction of the perianth that is a tube, relative lengths of the filaments and the perianth tube, and position of stigma relative to anthers. The ovary position is sessile or pedicellate, but in some species it may be in either state. Species native to the southeast (*Z. atamasca*, *Z. simpsonii* and *Z. treatiae*) have trifid stigmas and are winter–spring flowering. Other species with trifid stigmas are spring–summer flowering and native to the southwest (*Z. drummondii* and *Z. longifolia*) or introduced (*Z. grandiflora* from Mexico). All species with capitate stigmas are summer–fall flowering and native to the southwest (*Z. chlorosolen*, *Z. jonesii*, *Z. pulchella*, *Z. refugiensis*, *Z. smallii* and *Z. traubii*) or introduced (*Z. candida* from Argentina and *Z. citrina* from northeastern South America or Caribbean islands). All species with capitate stigmas have narrow leaves (1 to 5 mm), and three species with trifid stigmas (*Z. atamasca*, *Z. drummondii* and *Z. grandiflora*) have wide leaves (up to 7 or 8 mm).

113. KEENER, BRIAN R. University of Alabama, Tuscaloosa, AL 35487–Vascular Flora of Blount County, Alabama.

The vascular flora is documented for Blount County, Alabama. Blount County is located in the north central portion of the state and is surrounded by Marshall, Etowah, St. Clair, Jefferson, Walker, and Cullman counties. The drainage is primarily of the upper Black Warrior system. Blount County is located entirely within the Cumberland Plateau physiographic province. The Mixed Mesophytic Forest region, belonging to the Eastern Deciduous Forest Biome, is the major vegetation type found within the county. A total of 1,119 specific and infraspecific taxa representing 540 genera and 143 families are documented in the 165,763 hectare study area. Fifty taxa that are considered sensitive at state and federal levels are listed for the county. Non-native taxa were determined to comprise 17.5 percent of the flora. A total of 12 distinct plant communities were discovered to occur within the flora.

114. ANDERSON, LORAN C. Dept. Biological Science, Florida State University, Tallahassee, FL 32306.–Nassau County, Florida, a botanical "black hole."

This northeasternmost county of Florida is botanically undercollected because it is so distant from major universities and herbaria. I have added 180 species to the county list with only a few field trips. More importantly, several species of considerable phytogeographic interest occur in Nassau County. Some species, such as *Chasmanthium latifolium*, *Cyperus pseudovegetus*, *Hypericum gymnanthum*, *Leersia lenticularis*, *Rhynchospora oligantha*, *Scirpus koilolepis*, and *Tridens strictus*, were known to occur in Florida only in the panhandle (west of Tallahassee) prior to their discovery in Nassau County. Other collections represent second known occurrences within the state of species whose ranges barely extend into Florida.

115. SMALL, RANDALL L. Dept. of Botany, The University of Tennessee, Knoxville, TN 37996—Morphological and genetic variation in *Hibiscus* sect. *Muenchhusia* (Malvaceae).

The Rose Mallows (*Hibiscus* sect. *Muenchhusia*, Malvaceae) include five species: *Hibiscus coccineus*, *H. dasycalyx*, *H. grandiflorus*, *H. laevis*, and *H. moscheutos*. *Hibiscus moscheutos* includes up to four subspecies although the most recent taxonomic treatment recognizes only two (*H. moscheutos* subsp. *moscheutos* and *H. moscheutos* subsp. *lasiocarpus*). Previously published experimental hybridization studies as well as morphological data suggest that these species are divided into two natural groups: (1) *H. grandiflorus* and *H. moscheutos*; and (2) *H. coccineus*, *H. dasycalyx*, and *H. laevis*. Beyond these inferences, however, phylogenetic relationships among these species and their relationship to other *Hibiscus* species are unknown. Further, the number of subspecies of *H. moscheutos* that are recognized varies in different treatments and the suite of morphological characters that distinguish them is highly variable. Phylogenetic analyses of molecular data (both chloroplast and nuclear DNA sequences) are being conducted to elucidate relationships among the species of *Hibiscus* sect. *Muenchhusia*, and to discover their relationship to other *Hibiscus* species. Additionally, analyses of morphological and genetic variation within and among populations of those taxa referred to *H. moscheutos* are being conducted to determine how many unique biological entities exist within this taxon.

116. WATSON, LINDA E.<sup>1</sup>, TIMOTHY M. EVANS<sup>2</sup>, AMY B. KORNKVEN<sup>1</sup>, MATTHEW M. UNWIN<sup>1</sup>, AND PAUL L. BATES<sup>3</sup>. <sup>1</sup>Department of Botany, Miami University, Oxford, OH 45056; <sup>2</sup>Biology Department, Hope College, Holland, MI 49422; and <sup>3</sup>Biological Sciences Division, University of Nebraska-Lincoln, Lincoln, NE 68588 — Phylogenetic relationships of *Artemisia* and its allies (Asteraceae), based on molecular data.

The Anthemideae is primarily an Old World tribe in the Asteraceae, and includes commonly known cultivars such as daisies and chrysanthemums. Approximately 30% of species that comprise this relatively large tribe of 109 genera and 1740 species belong to a paraphyletic assemblage composed of two large genera: *Artemisia* (390 species) and *Seriphidium* (130 species), plus ten small genera (*Stilnolepis*, *Ajaniopsis*, *Filifolium*, *Kaschgaria*, *Crossostephium*, *Sphaeromeria*, *Neopallasia*, *Turaniphytum*, *Mausolea*, and *Picrothamnus*). All of these genera, except *Sphaeromeria*, have at various times been treated as one enormous genus composed of over 500 species (*Artemisia* s.l.). This cosmopolitan assemblage of woody and herbaceous species is ecologically and economically important on a global scale, with many members occurring as dominant components of sagebrush communities worldwide and possessing numerous medicinal properties. Despite the well-known importance of *Artemisia* and its allies, there is no consensus on either generic circumscription or infrageneric classification. Furthermore, there is little understanding of the evolutionary trends in floral and capitular morphology associated with the rapid radiation that occurred within the tribe in response to a shift from insect to wind pollination. We are constructing molecular phylogenies to delineate the segregate and allied genera, and to resolve subgeneric boundaries within *Artemisia* s.s. and *Seriphidium*.

117. MARTIN, BRIAN H., MICHAEL WOODS, AND ALVIN R. DIAMOND JR.  
Department Biological and Environmental Sciences, Troy State University, Troy.  
AL 36082- The Vascular Flora of Coffee County, Alabama.

A survey of the vascular plants of Coffee County, Alabama was conducted from June 1999 through December 2000. Coffee County, which occurs in the Coastal Plain Region of the Southeastern United States, consists of 173,235 hectares in the southeastern section of the state. The county consists of low rolling hills in the north to flat with few gentle sloping ridges in the south. To increase the diversity of taxa collected, an attempt was made to collect from all habitats within the county. Also, the Troy State University (TROY), Auburn University (AU), and University of Alabama (UA) Herbaria were searched for specimens previously collected in the county. A total of 735 taxa representing 419 genera and 137 families were found within Coffee County. The Asteraceae represented the largest family with 83 taxa. Poaceae and Fabaceae were the next largest families with 57 and 52 taxa, respectively. *Quercus* represented the largest genus with 14 species. Support for this project was provided by both the Alabama Wildflower Society and The Alabama Department of Public Health ALERT Grant.

118. PENNINGTON, TIFFANY AND MICHAEL WOODS. Department of Biological and Environmental Sciences, Troy State University, Troy AL 36082-The Vascular Flora of Dale County, Alabama.

Dale County, which occurs in the Coastal Plain Region of the Southeastern United States, consists of 145,045 hectares located in the wiregrass region of southeast Alabama. The survey of the vascular flora of Dale County Alabama was conducted from August 1999 through December 2000. Five primary collection sites were chosen as a representation of the various habitats known to occur within the county. In an attempt to increase the number of taxa, collections were also made from other locations throughout the county. To obtain a more complete floristic inventory, the herbaria at Troy State University (TROY), Auburn University (AUA), and University of Alabama (UNA) were searched for specimens representing taxa not collected during this project. Preliminary results indicate over 725 taxa representing approximately 410 genera and 130 families were found to occur within Dale County. The Asteraceae represented the largest family with 80 plus species. Poaceae and Fabaceae were the next largest families. *Quercus* represented the largest genus with 14 species. The Alabama Wildflower Society, the Birmingham Audubon Society, and The Alabama Department of Public Health ALERT Grant provided support for this project.

119. HALL, JAMES A., MICHAEL WOODS, AND ALVIN R. DIAMOND JR.  
Department of Biological and Environmental Sciences, Troy State University,  
Troy, AL 36082-The Vascular Flora of the Pike County Pocosin Nature Preserve,  
Alabama.

The Pike County Pocosin Nature Preserve is located approximately 6 miles due east of the City of Troy, Alabama. The Preserve consists of 84 hectares of xeric sandy ridges interrupted by deep horseshoe shaped ravines. The soils of the sandy ridges are extremely nutrient poor and support a dwarf oak-lichen community. The ravines, which range from seventy-five to one hundred feet deep and up to two hundred feet across, support a varied mesic hardwood forest community. A large, clear spring can be found at the base of each ravine. The floristic survey was conducted from March 1999 through September 2000. A total of 334 taxa representing 233 genera and 94 families were found to occur within the Nature Preserve. Poaceae represented the largest family with 42 species. Asteraceae and Fabaceae were the next largest families with 39 and 31 species, respectively. *Quercus* represented the largest genus with 12 species. Support for this project was provided by both the Alabama Department of Conservation and Natural Resources, and The Alabama Department of Public Health ALERT Grant.

120. REESE, NANNETTE. University of Alabama, Biodiversity and Systematics, Box 870345, Tuscaloosa, AL 35487-A cladistic analysis of *Echinodorus*, with emphasis on the placement of *E. floridanus* (Alismataceae).

The genus *Echinodorus* comprises 27 species found throughout North, Central, and South America. The most recently described species, *Echinodorus floridanus* Haynes and Burkhalter, 1997, is diagnosable from other North American *Echinodorus* species by its large size, leaf shape, and stellate pubescence and is endemic to the Florida panhandle. We hypothesized that *E. floridanus* is closely related to South American taxa based on shared morphological traits. A cladistic analysis of 127 morphological characters taken from 31 *Echinodorus* species and subspecies suggest *E. floridanus* is most closely related to South American taxa. We discuss relationships within the family and among putative outgroup taxa and provide characters uniting the various groupings therein.

121. LYNCH REGINA S., REBECCA BRAY AND LYTTON MUSSELMAN Department of Biological Sciences, Old Dominion University, Norfolk, VA 23529-0266.-A morphological investigation of some tetraploid *Isoetes* populations of the eastern United States.

The genus *Isoetes* comprises a group of cryptic, largely amphibious, pteridophytes known as quillworts. These plants are systematically challenging due to their lack of taxonomically significant characters. Tetraploids of the eastern United States are particularly complex because of their phenoplasticity. A peculiar tetraploid ( $2n=44$ ) was found in the northwest section of Chesterfield County, Virginia. This population has dimorphic megaspores, a characteristic which often indicates hybridism, although polymorphism is also known in some species such as *I. flaccida* ( $2n=22$ ). The spore morphology of Chesterfield plants is somewhat similar to both *I. hyemalis* and *I. riparia*. Detailed descriptions of cross sections, presence or absence of peripheral fiber strands, percentage of velum coverage, sporangial wall pigmentation, presence or absence of scales, spore size and texture are compared with other tetraploids to determine their relationships. The hypothesis that the Chesterfield population is related to or a product of *I. hyemalis* ( $2n=44$ ) and *I. riparia* ( $2n=44$ ) is considered.

122. Pell, Susan K. and Lowell Urbatsch. Department of Biological Sciences, Louisiana State University. Evaluation of evolutionary relationships in the cashew family using chloroplast DNA sequence data.

Anacardiaceae, the cashew family, comprises ca. 600 species in 80 genera. It is a primarily pantropical family with a center of diversity in Southeast Asia. Anacardiaceae is most well known for its edible fruits and seeds, contact dermatitis-causing species, and lacquer plants. Recent studies have indicated that the most widely used classification, Engler's 1892 treatment consisting of five tribes (Anacardieae, Dobineae, Rhoeae, Semecarpeae, and Spondiadeae), is artificial. In order to develop a clearer picture of the circumscription of the tribes within Anacardiaceae, a phylogeny has been constructed from DNA sequence data of the chloroplast matK gene and the trnL-trnF spacer. Preliminary matK sequence data show that three, rather than five, lineages have evolved within the family. The data also find that Burseraceae is the sister group to a monophyletic Anacardiaceae, a hypothesis put forth by several previous authors.

123. SHAW, JOEY T. AND B. EUGENE WOFFORD. The University of Tennessee, Knoxville—The woody plants of the Big South Fork National River and Recreation Area (BSFNRR), Tennessee & Kentucky.

The woody flora of the BSFNRR was collected during two growing seasons from 1999 to 2000. The 123,000 ac. study area lies on the Cumberland Plateau in Tennessee and Kentucky. Seven hundred and sixty accessions yielded 51 families, 100 genera, and 183 species. County



records totaled 128; *Magnolia fraseri* was collected for the first time from the Cumberland Plateau in Tennessee. Fourteen Federal or State listed taxa were collected including *Comptonia peregrina*, which has only been collected two other times dating back to 1842. Voucher specimens were deposited in the herbarium of the University of Tennessee, Knoxville.

124. HEAFNER, KERRY D., R. JAMES HICKEY, AND LINDA E. WATSON. Department of Botany, Miami University, Oxford, Ohio 45056—Systematic studies of the *Isoetes melanopoda* Gay & Durieu assemblage in North America.

Black-footed quillwort, *Isoetes melanopoda* Gay & Durieu, was described based on material collected in a farmed field in Menard County, Illinois. Characters that distinguished this species from other North American *Isoetes* were an ephemeral phenology, relatively small megaspores generally classified as tuberculate, and the presence of blackened, sclerified leaf bases (phyllopodia) that persist after the subulate portion of the microphyll decays away. Since the original description was published in 1864, several southeastern quillworts have been identified that exhibit these same characters and occur in habitats as diverse as farmed fields, intermittent woodland streams, temporary pools rock outcrops, and upland depression swamp forests. We are using three independent lines of evidence to assess whether *I. melanopoda* is a single species that is variable in terms of habitat and morphology, or whether an assemblage of diploid, cryptic species has been subsumed under a common binomial.

125. GREGORY, PAMELA G. AND TIFFANY A. BOHLMANN, Jacksonville State University—Sperm transfer and utilization in the ground crickets *Allonemobius fasciatus* and *A. socius*.

*Allonemobius fasciatus* and *A. socius* are ground crickets that inhabit short grassland areas in the northeastern and southeastern United States and west at least to Illinois. The northern cricket, *A. fasciatus*, meets the southern cricket, *A. socius*, in central part of the United States. Some populations overlap and a limited amount of hybridization occurs in mixed populations. Even though the females of both species can store both *A. fasciatus* and *A. socius* males sperm in their spermatheca, the conspecific males fertilizes the vast majority of the offspring. Here we will reflect on the possible mechanisms of this reproductive isolating barrier between these two species.

126. ROGERS, PATRICIA C., MICHELLE HERRELL, JAMES E. JOY. Dept. Biological Sciences, Marshall University, Huntington, WV 25755—Growth rates of carrion fly larvae under field conditions in southwestern West Virginia.

Blow flies are common dipterans on carcasses that serve as ovipositor sites and larval food sources. Developing maggots, which may occur by the thousands on any carcass, can rapidly dispose of a dead animal. This paper reports development rates of *Phaenecia regina* (the black blow fly) larvae on sunlit and shaded raccoon carcasses over a 7-day period in May 2000 under field conditions in Cabell County, West Virginia. Larval development rates are compared to both ambient and maggot mass temperatures. Growth rates were significantly higher on the sunlit carcass even though recorded maggot mass temperatures were essentially the same for the shaded and sunlit carcass, suggesting that light may play an important role in larval development. Developing larvae of *Phaenecia caeruleiviridis* and *Sarcophaga* were also encountered during the course of this study, but in relatively low numbers.

127. BAUER, RAYMOND T. Dept. Biology, University of Louisiana at Lafayette, Lafayette, LA 70504-2451. —Male mating strategies of decapod shrimps: mate guarding versus pure searching.

In many decapod crustaceans (shrimps, lobsters, crabs), females have a limited period of receptivity to mating. In many such species, males find, guard, and defend females. One model predicts that mate guarding should always evolve in species with limited female receptivity. This model was tested with a penaeoid shrimp, *Sicyonia dorsalis*, and a caridean shrimp, *Palaemonetes pugio*, in which mating occurs shortly after a female molt. Time-lapse video observations show that males do not recognize a premolt female until shortly before her molt. Males do not engage in behaviors associated with mate guarding such as pairing with females or aggression towards other males. The mating strategy of these shrimps is "pure searching" in which mobile males contact many females in order to find and quickly mate with a receptive one. Selection for pure searching occurs in species with high-density, aggregated populations with mobile individuals. Males are small, with cheliped weaponry similar to females, and not obviously aggressive towards conspecifics. In species with mate guarding, males are large, with enlarged cheliped weaponry, and noticeably aggressive.

128. HINTON, JULIANA AND HARRY MEYER. Dept. Biological/Environmental Sciences, McNeese State University, Lake Charles, LA 70609. -Tardigrades of Mississippi.

The distribution of tardigrades in the American Deep South is poorly known. There are no published reports of tardigrades from the state of Mississippi. We examined samples of moss and lichen from several counties in southeastern and south central Mississippi. Species found in these samples included *Macrobiotus ovovillosus*, *Minibiotus intermedius*, *Doryphoribius flavus*, and *Milnesium tardigradum*.

129. Estep, M. C., Richard N. Henson, and Mary U. Connell. Appalachian State University, Boone, NC 28608- Phylogeography of the Desert Scorpion: *Paruroctonus utahensis* Williams, using 16S rDNA Sequence.

*Paruroctonus utahensis* is a psammophilic species of scorpion occurring only on shifting sand dunes. During the late Pleistocene large shifting sand dunes were widespread across much of the southwestern United States. It is hypothesized that during this time *Paruroctonus utahensis* inhabited these widespread sand dunes. Over the last 4000 years these shifting sand dunes have been shrinking in size due to plant invasion. We are interested in looking at the genetic diversity that may have accumulated as a result of the reduction of gene flow between these isolated scorpion populations. Specimens of *P. utahensis* have been collected from Monahans Sandhills State Park, Guadalupe Mountains National Park, and El Paso, Texas as well as White Sands National Monument, New Mexico. Sequence comparisons of a 500 bp section of mitochondria 16S rDNA are being used to assess each population and to compare these populations. The initial results of these comparisons will be presented.

130. Henson, RN. Appalachian State University, Boone, NC 28608. -Behavior, distribution and habitat selection of Texas scorpions.

Three thousand six hundred and twenty seven scorpions were collected throughout Texas from 1988 to 2000. These scorpions represent three families, six genera and 18 of the 20 known Texas species. These species constitute about 23% of the known species within the United States. Collecting methods primarily involved the use of ultraviolet light as well as turning over of rocks and decaying ground cover. Of the 20 Texas species most are found within the western part of the state, primarily in the semi-arid trans-Pecos area. Scorpion habitat varies considerably from the very specific to the very general, while scorpion numbers range from rare to common and localities vary from single sites to large expansive areas. Sympatric species utilize selective niches within a particular habitat or substrate. Behavior may range from psammophilic burrowing species to bark scorpions which hide under ground cover or vegetation.



131. BOST, KAREN C., MARY U. CONNELL, AND RICHARD N. HENSON. Dept. of Biology, Appalachian State University, Boone, NC 28608-Molecular comparisons of four sympatric scorpion species of the genus *Vaejovis* (*V. coahuilae*, *V. russelli*, *V. globosus*, *V. crassimanus*) using a 500 base pair sequence of mitochondrial 16S rDNA.

The genus *Vaejovis* has the largest distribution and degree of variation of any scorpion genus found in the United States. Due to a lack of distinct morphological characteristics, the phylogenetic history of this genus is poorly understood. Four problematic sympatric species are *V. coahuilae*, *V. russelli*, *V. globosus*, and *V. crassimanus*. These species are sometimes difficult to distinguish from each other morphologically. Each species includes individuals that strictly display representative characteristics, and individuals difficult to accurately classify. We are examining these species using a 500 base pair sequence of mitochondrial 16S rDNA in order to assess phylogenetic relationships. Habitat may play a role in variation seen between different populations of the Vaejovidae. *V. globosus* is limited to sandy habitats along the Rio Grande while *V. coahuilae* is cosmopolitan in distribution throughout our collection range. *V. crassimanus* and *V. russelli* are more selective in habitat than *V. coahuilae* and less widely distributed. Collections were made in Big Bend National Park and Guadalupe Mountains National Park Texas, along with Living Desert State Park and White Sands National Monument New Mexico. Substrates at these sites ranged from consolidated sand to rocky substrate. Collected data will be compared to the geographically isolated *Vaejovis carolinianus*.

132. STEWART, KEVIN D.<sup>1</sup>, CHARLES H. NELSON<sup>2</sup>, RICHARD M. DUFFIELD<sup>1</sup>. <sup>1</sup>Dept. Biology, Howard University, Washington, D.C. 20059 and <sup>2</sup>Dept. Biological and Environmental Sciences The University of Tennessee at Chattanooga, Chattanooga, TN 37403 – Novel Occurrence of Stoneflies (Plecoptera) in the Diet of the Red-Spotted Newt, *Notophthalmus viridescens*

Diet samples were taken between May 26, 1997 to June 9, 1998 from a population of Red-Spotted Newt, *Notophthalmus viridescens*, at an impoundment in Fredrick Co. Maryland. The population was sampled at two-week intervals. Approximately 30 samples were taken during each visit. During the study the stomach contents of 652 newts were sampled in which 6,696 items were recovered. The mean number of items per sample was 10.3. Approximately 67% of all the recovered items were Diptera, of which most were larvae and pupae. From the diet items 10 stoneflies (Plecoptera) were recovered, representing the families Capniidae, Taeniopterygidae, Nemouridae, and Leuctridae. All stoneflies were adults except a mature female nymph of the angulate snowfly, *Paracapnia augulata*. Only one sample contained more than a single specimen, namely a sample from May 24, 1998 which contained two adult little black forestflies, *Amphinemura nigritta*. All Plecoptera specimens were recovered in late winter and spring with the exception of one partially digested adult needlefly, *Leuctra* spp. that was recovered on November 9, 1997. Although there have been many studies of newt diet, this is the first to report stoneflies.

133. PLESZEWSKI, ROBERT J., AND RAY S. WILLIAMS. Appalachian State University, Boone, NC 28608-Analysis of cliff-face microarthropod communities.

This study presents the first quantitative study of microarthropod communities on exposed cliff-faces. The study site was located in the Linville Gorge Wilderness Area in Burke County, North Carolina. Microarthropod communities were compared at 3 sites; cliff-face, adjacent ridge and cliff-base. Sampling was conducted along transects on the Gold Coast Wall ridge and base. Cliff-face samples were collected on accessible shelves containing vegetation and soil substrate. Sampling consisted of collecting 5cm diameter x 5cm deep litter cores. Cores were placed into a modified Tullgren funnel for microarthropod extraction for 7 days. Sample organisms were categorized as acari, collembola, other and total microarthropods. There was a significant effect of site on the total number of microarthropods, acari and collembola

(ANOVA). For each group, the cliff-face contained lower numbers of microarthropods, especially when compared to the ridge top (Duncan's multiple range test). There were 50% fewer total microarthropods on the cliff-face than the ridge top. Microarthropod distribution may be the result of site substrate and vegetation. Litter and organic layers typical of a forest ecosystem were not developed on the cliff-face shelves.

134. MATTINGLY<sup>1</sup>, SHANNA, FRANK A. ROMANO<sup>1</sup>, AND DIANE R. NELSON <sup>2</sup>.  
<sup>1</sup>Jacksonville State University, Jacksonville, AL, 36265, <sup>2</sup>East Tennessee State University, Johnson City, TN. -A survey of terrestrial tardigrades on Dauphin Island, Alabama.

To sample tardigrades on Dauphin Island, AL four transects oriented north to south were established through forested habitats. Within each transect trees supporting appropriate moss and lichen growths were selected and sampled (moss/lichens and leaf litter). Seasonal sampling began in October 1999 and will continue through January 2001. Samples were returned to JSU where they were rehydrated and tardigrades extracted. The numbers of tardigrades extracted from the Oct. '99 (296) and Jan. '00 (193) collections are as follows: transect 1 (east end) 16 and 20; transect 2 (2 km west of T1) 143 and 36; transect 3 (2 km west of T2) 99 and 132; and transect 4 (3 km west of T3) 38 and 5. No tardigrades were collected from a live oak living in a salt marsh on the north shore (bayside) of the island (Transect 2). Only 3 tardigrades were collected from a live oak living on a sand dune on the south shore (gulf side) of the island (Transect 1). The majority of the tardigrades were collected from the middle portions of the island (between the shores) and from the widest, most protected and most heavily wooded area (Transect 2).

135. PETERSON, LYNSEY R. AND A. JOSEPH POLLARD. Dept. of Biology, Furman University, Greenville, SC 29613—Spread of metals through an invertebrate food chain as influenced by a nickel-hyperaccumulating plant, *Alyssum pintodasilvae*

Phytoremediation, the use of plants to remove contaminants from soils, is a topic of much interest and research. A potential drawback of phytoremediation is that introducing metal-accumulating plants could cause elements tightly bound in the soil matrix to become more mobile, and thus facilitate the movement of these contaminants through the ecosystem. To investigate this process, we collected plant, soil, and invertebrate samples from locations near Bragança, Portugal, where serpentine mineralogy has produced communities dominated by the nickel hyperaccumulating plant *Alyssum pintodasilvae*. We found significantly greater concentrations of Ni in the tissues of grasshoppers, other insects, and spiders collected from sites where *A. pintodasilvae* was common than from sites where the hyperaccumulator was not found. Metals such as cobalt and chromium, occurring in high concentrations in the serpentine soil but not accumulated by *A. pintodasilvae*, were not elevated in the invertebrates. The findings suggest that in these communities, the flux of nickel to herbivore and carnivore trophic levels is specifically facilitated by the presence of a plant that hyperaccumulates this metal. The development of commercial phytoremediation technology may require appropriate precautions to avoid inadvertently creating one environmental problem while cleaning up another.

136. SOUTHER, REBECCA F.<sup>1</sup>, GARY P. SHAFFER<sup>2</sup>, AND RICHARD GOYER<sup>1</sup>.  
<sup>1</sup>Dept. of Entomology, Louisiana State University, Baton Rouge, LA70803 and  
<sup>2</sup>Dept. of Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402- The interactive effects of herbivory, salinity, flooding, and nutrients on baldcypress (*Taxodium distichum*) and tupelo gum (*Nyssa aquatica*).

The swamps in coastal Louisiana were harvested *en masse* in the early 1800's and many have not regenerated. Lack of regeneration has been attributed to salt water intrusion, subsidence,

and leveeing of the Mississippi River. In addition, these factors are expected to have interactive effects and are currently contributing to the decline of the baldcypress-tupelogram swamps in coastal Louisiana. Furthermore, the impact of lepidopteran herbivory on these trees has not been investigated when combined with multiple stresses. To investigate these multiple stresses, in a greenhouse study, we subjected baldcypress and tupelogram seedlings to a 2x2x2x3 factorial including 2 herbivory levels, 2 fertilizer regimes, 2 water levels and 3 low salinity levels. Herbivory combined with salinity decreased growth of Tupelo more than cypress. A field study in southern Lake Maurepas was conducted on mature trees in the field that monitored productivity of the trees along defoliation, nutrient, and salinity gradients.

137. PEOPLES, SETH AND J.K. SHULL. Department of Biology, Appalachian State University, Boone, NC 28608. -Female mating preference in a *Drosophila melanogaster* stock that is mutant for sepia (se) eyes.

We are continuing the study of female mate preference in *Drosophila melanogaster* based on wing morphology. As a control, we looked at a mutant stock that has nothing to do with wing morphology, namely sepia eyes (se). Preliminary results indicate that females homozygous for se/se choose sepia-eyed males over wild-type males. When this experiment was repeated in the dark, sepia females overwhelmingly choose wild-type males over sepia-eyed males. This indicates that sepia females may be using a visual cue in mate choice.

138. PHILLIPS, BRYAN W. AND CAROL E. JOHNSTON. Dept. Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849 -Faunal changes in a Southeastern stream: effects of land-use and habitat fragmentation.

Human caused effects through changes such as stream impoundment and changes in land-use often lead to the degradation of aquatic systems. Documentation of such effects is one step in the process of protecting and restoring aquatic ecosystems, and aids in understanding the dynamics of habitat and biodiversity losses. By comparing contemporary data on the fish community of Bear Creek (Tennessee River drainage, Alabama and Mississippi) to a thorough historical dataset, we have documented numerous changes in the fish fauna of this system. The largest effects were most likely caused by the construction of four impoundments of the Bear Creek system since the historical survey (1968). These impoundments have not only eliminated stream habitat due to inundation and altered the physical habitat immediately above and below the reservoirs, but have fragmented the remaining stream habitat, resulting in the loss of several species, probably due to this factor alone. Faunal changes are seen throughout the Bear Creek system, but some sites remain relatively pristine.

139. STRANGE, REX M.<sup>1</sup>, AND RICHARD L. MAYDEN<sup>2</sup>. <sup>1</sup>Dept. of Biology, Southeast Missouri State University, Cape Girardeau, MO and <sup>2</sup>Dept. of Biological Sciences, Biodiversity and Systematics, The University of Alabama, Tuscaloosa, AL 35487-0344. - Phylogenetic relationships among North American *Phoxinus* species (Teleostei: Cyprinidae) as inferred from mitochondrial cytochrome *b* sequences: taxonomic and biogeographic considerations.

We estimated phylogenetic relationships among species currently placed in the genus *Phoxinus* and representatives of other cyprinid clades using cytochrome *b* sequence variation. Our analyses resolved five monophyletic groups: 1) shiner clade, 2) tribe Abramini, 3) western clade, 4) subgenus *Chrosomus* (inclusive of all North American *Phoxinus*), and 5) European *Phoxinus*. Relationships among these clades are essentially unresolved, and *Phoxinus* species from Europe and North America do not form a monophyletic group. Among North American *Phoxinus* species the subgenus *Chrosomus* is sister to the monotypic subgenus *Pfille* (*P. neogaeus*). *Chrosomus* consists of two monophyletic groups. *Phoxinus erythrogaster* and *P. eos* form the '*P. erythrogaster* clade' that is sister to the 'mountain dace clade' containing two sister-species pairs. *Phoxinus cumberlandensis* and the undescribed laural dace form one

species pair that is sister to *P. oreas* plus *P. tennesseensis*. These findings are consistent with known biogeographic and geological histories of the areas and apparent adaptive trends involving reproductive behavior among North American *Phoxinus*. Research was supported in part by the National Science Foundation (DEB 9307132) and The University of Alabama.

140. HERRINGTON, STEVEN J. AND CAROL E. JOHNSTON. Dept. of Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849. -Differences in fish community structure within a Southeastern stream system: effects of land use.

In general, streams draining forested watersheds remain relatively pristine, while streams within urban or agricultural areas are often degraded by altered hydrological regimes, increased sedimentation, and decreased habitat heterogeneity. These effects are often difficult to document, however, due to confounding factors such as faunal differences, stream size, and physiographic changes. Our goal was to compare fish community structure within a stream system with both forested and urban/agricultural land uses. Comparing sites of similar stream order that differed only in land use revealed dramatic differences in fish fauna. Unforested sites had higher species diversity yet were faunally dissimilar than forested sites. Unforested sites were also siltier, contained less woody debris, and had less habitat heterogeneity than forested sites. These results reflected a shift of fish communities from degradation-sensitive taxa (Cyprinidae and Percidae) in forested sites to degradation-tolerant taxa (Centrarchidae) in unforested sites according to changes in habitat quality.

141. SCHWARTZ, F. J. Institute of Marine Sciences, University of North Carolina, Morehead City, NC 28557-3209 - Cytogenetics of elasmobranchs: genome/phylogenetic implications.

Colcemid treated blood sample methods permitted conventional cytogenetic studies of elasmobranch karyotypes. Representatives from superorders: Galeomorphii (4 orders), Squalomorphii (3 orders), Squatinomorphii (1 genus), and Batoidii (4 orders) were karyotyped. The 36 elasmobranch species karyotyped by this method, together with 20 species using colchine, represent about 4.3% of living chondrichthyes. DNA content exhibited the greatest variability and arm number least for 46 species for which chromosome arm numbers, centromere numbers, and DNA contents were available. Thus arm number has been the most conservative genomic parameter in elasmobranch evolution. A fusion model best explained (rather than fission or modal models) the data obtained for galeomorphs studied and can be extrapolated to explain karyotypic change in other superorders. Arm number, in context of phylogenetic relationships established by morphologists, suggests a broad theory that accounts parsimoniously for the origin of karyotypic diversity that has been observed among the chondrichthyes. Elasmobranchs exist at the same ploidy level, which is higher than the ploidy level of holocephalans. Karyotype evolution has involved, primarily, decreases in arm and centromere numbers from a common polyploid ancestral genome, compared to that of holocephalans. This occurred gradually since the radiation of modern elasmobranchs (neosalachians) began before or during the Jurassic.

142. CLEMENTS, MARK D., KYLE R. PILLER, NORMAN MERCADO-SILVA, HENRY L. BART JR., DAVID L. HURLEY. Tulane University Museum of Natural History, Belle Chasse, LA 70037. -Molecular variation within *Scartomyzon* (Teleostomi: Catostomidae): A preliminary study

The Family Catostomidae is a diverse group of mostly bottom oriented freshwater fishes. Eleven genera and at least 60 taxa are currently recognized within the family. The North American tribe Moxostomatini contains almost half of the taxa within the family and is comprised of seven genera ( *Lagochila*, *Moxostoma*, *Thoburnia*, *Hypentelium*, *Erimyzon*, *Minytrema*, and *Scartomyzon*). *Scartomyzon* was originally described by Fowler in 1913 as a

subgenus of *Moxostoma*. Traditionally most ichthyologists recognized *Scartomyzon* as a subgenus, although recently, some have suggested that it warrants generic status. *Scartomyzon* contains taxa distributed on the Atlantic slope, Gulf Coast drainages of Texas and Mexico, and Pacific Slope drainages of West-Central Mexico. Eight to ten taxa are recognized within the group. We tested the monophyly of *Scartomyzon* using partial sequence data from the mitochondrially encoded cytochrome-b gene. We analyzed the data using maximum parsimony. The taxonomic history, molecular variation, and phylogenetic relationships of *Scartomyzon* will be discussed

143. PILLER, KYLE R. Tulane University Museum of Natural History, Belle Chasse, LA 70037.-Ecomorphological variation within the *Etheostoma blennioides* complex (Teleostomi:Percidae)

The relationship between ecology and morphology has long intrigued biologists. Previous ecomorphological studies have assessed the correlation between predator-prey relationships, community organization, and niche overlap between groups of taxa, but few have examined connection between local habitat conditions and morphological phenotype within a clade. *Etheostoma blennioides*, (Teleostomi: Percidae) is a wide-ranging polytypic taxon that inhabits a broad-range of aquatic habitats, including both lotic and lentic environments. This study examined the relationship between local habitat conditions and morphological phenotype during the reproductive season. Ecological data were gathered for 24 populations from across the range of the species. Morphometric data were collected from specimens for which ecological data were gathered. Both ecological and morphological data were submitted to multivariate analysis and examined in a phylogenetic framework. Strong variation was noted in pectoral fin size and caudal fin length, both of which have been shown to be strongly influenced by differences in stream flow. Significant variation in habitat was determined for males, females, and juveniles.

144. NEELY, DAVID A. The University of Alabama, Tuscaloosa, AL 35487-0345. – Morphological and molecular analysis of the Mobile Basin banded sculpin (*Cottus carolinae*) complex.

Most populations of banded sculpins in the Mobile Basin have historically been assigned to one of two subspecies of *Cottus carolinae* (*C. c. infernalis* and *C. c. zopherus*). Geographic patterns of morphological variation in "banded sculpins" from across the Mobile Basin observed in this study are generally congruent with the results of an unpublished allozyme study, but are incongruent with the currently accepted taxonomy. The Black Warrior River drainage contains four endemic sculpin taxa, diagnosable by body shape, degree of development of the lateralis system, and pigmentation patterns. The *C. c. infernalis* complex contains at least three distinct forms, diagnosable on the basis of saddle width and body shape. Populations in the Coosa and Cahaba rivers above the Fall Line exhibit a bewildering array of variation, with evidence of at least two sympatric cryptic taxa in these drainages. Phylogenetic analysis of sequence data from the mitochondrial control region generally supports the conclusions of the morphological data set, but also suggests other areas of further study.

145. LANG, NICHOLAS J.<sup>1</sup> AND LAWRENCE M. PAGE<sup>2</sup>. <sup>1</sup> Department of Biology, University of Alabama, Tuscaloosa, AL 35487 and <sup>2</sup> Illinois Natural History Survey, Champaign, IL 61820. -Variation of the Longear Sunfish (*Lepomis megalotis*) in Illinois (Osteichthyes: Centrarchidae).

Two nominal subspecies of the Longear Sunfish occur within the state of Illinois. *Lepomis megalotis megalotis* (Rafinesque) occurs in the Mississippi and Ohio River basins while *Lepomis megalotis peltastes* (Cope) occurs in the Great Lakes and Illinois River drainages. This study was undertaken in order to define the limits of each subspecies in Illinois and explore the hypothesis of an contact zone. Taxa were diagnosed using lateral line, above

lateral line and below lateral line scale counts and two opercular flap angle measurements. Data support the designation of populations in the Upper Illinois drainage as *L. m. peltastes*, with *L. m. megalotis* occupying the rest of the state. Scale count data support existence of a restricted contact zone between the headwaters of the Vermilion drainage system and several tributary systems of the Illinois River.

146. POWERS, STEVEN L. AND RICHARD L. MAYDEN. Department of Biological Sciences, University of Alabama, Tuscaloosa, AL 35487. -Meristic and morphometric differences of disjunct populations of *Etheostoma baileyi* (Percidae: Ulocentra)

Preliminary meristic and morphometric analyses of *Etheostoma baileyi* indicated that populations from tributaries to Cumberland River downstream of Cumberland Falls are diagnosable from upper Cumberland and Kentucky River populations by more extensive prepectoral squamation. Samples also had modal differences in unpored lateral line scales, scales below lateral line, and infraorbital pores. Sheared principal components analysis was also performed on 23 mensural characters. Snout length, eye diameter, length of dorsal spines, length of dorsal rays and interorbital width loaded heavily on sheared principal components two and three. Scatterplots of these sheared principal components indicated that Cumberland River populations below Cumberland Falls represent an independent evolutionary lineage.

147. SKELTON, CHRISTOPHER E.<sup>1</sup>, GERALD R. DINKINS<sup>2</sup>, AND BYRON J. FREEMAN<sup>3</sup>. <sup>1</sup>GA Dept. Nat. Res., Georgia Natural Heritage Program, Social Circle, GA, 30025. <sup>2</sup>Dinkins Biological Consulting, Powell, TN 37849, <sup>3</sup>University of Georgia, Institute of Ecology, Athens, GA 30602. -Systematics of the *Hybopsis winchelli* species complex.

Studies of the minnow genus *Hybopsis* by G. Clemmer revealed a form closely related to *Hybopsis winchelli* Girard in Gulf of Mexico drainages east of the Mobile Basin. This form is found in the Perdido River system of Alabama east to the Ochlockonee River system of Florida. The form differs from *Hybopsis winchelli* in squamation, tuberculation, and coloration and is regarded here as an undescribed species. Recent genetic evidence also supports this hypothesis. Another *Hybopsis* form recently collected from the Etowah River in the upper Coosa River system is currently thought to be an undescribed species. However, comparison of nuptial males of the Etowah form with nuptial *Hybopsis winchelli* indicates the two are conspecific.

148. GEORGE, ANNA L. AND RICHARD L. MAYDEN. Dept. of Biological Sciences, University of Alabama, Tuscaloosa, AL 35487. -Contested language in the Endangered Species Act: The importance of species concepts.

Although considered one of the landmark environmental laws in the United States, the Endangered Species Act has been criticized simultaneously for being too weak or too strong. As with any law, vague language allows for legal loopholes to be made, providing various ways of undermining the intention of the Act. Such language includes the definition of "taking" an endangered species, what constitutes "harm" to a species, as well as the definition of "species" itself. Although the Supreme Court has established a precedent in upholding the law, as seen in *Sweet Home Chapter of Communities for a Great Oregon v. Babbitt*, current legal battles have challenged the interpretation of a species and the science behind the listing. Traditionally, most interpretations of the Act have relied upon either the Biological Species Concept or the Evolutionarily Significant Unit to guide decisions in management policies. A recent battle over the listing of the Alabama sturgeon, *Scaphirhynchus suttkusi*, demonstrates why it is imperative to understand various species concepts, and how it is necessary to use an appropriate species concept for listing decisions.

149. JOY, J. E. AND J. A. BRADBURY. Dept. of Biological Sciences, Marshall University, Huntington, WV 25755—Endohelminths of basses in river and reservoir ecosystems of West Virginia.

Two hundred and fifteen basses, representing 5 species, were collected from selected river and reservoir sites in West Virginia from May through November of 1997. Basses were infected with 16 helminth parasite taxa (4 Digenea, 4 Cestoda 5 Nematoda and 3 Acanthocephala) in their visceral organs. *Proteocephalus* sp. pleuroceroids, *Rhipidocotyla papillosa*, *Neoechinorhynchus cylindratus*, *Spinitectus carolini* and *Camallanus oxycephalus* were the most commonly encountered helminths. *Spiroxys* sp. *Echinorhynchus salmonis* and *Pomphorhynchus bulbicoli* were found only in river hosts, whereas *Pisciamphistoma stunkardi*, *Bothriocephalus* sp., *Proteocephalus ambloplitis* (adults), *Contracaecum* sp. (larvae) and *Neoechinorhynchus cylindratus* infected only reservoir hosts.

150. FLEER, KATRYNA A. AND JAMES E. JOY. Dept. of Biological Sciences, Marshall University, Huntington, WV 25755—Monogenetic trematodes (Mazocraeoidae) from gizzard shad in West Virginia.

A total of 236 gizzard shad, *Dorosoma cepedianum*, from two localities in West Virginia—the Ohio River and the Kanawha River—were examined for monogenetic trematodes. Three different species were identified: *Mazocraeoides tennesseensis*, *M. olentangiensis*, and *Pseudanthocotyloides banghami*. All three species were found in the gills of shad from each river. *M. tennesseensis* infected the most hosts overall, occurring in 26% of the shad (host samples from both river systems combined). Conversely, *M. olentangiensis* and *P. banghami* infected 9% and 2% of shad, respectively. Mean intensities were low (<2) for all three species.

151. STANTON, GEORGE E.<sup>1</sup> AND PAMELA T. LOPEZ<sup>2</sup>. <sup>1</sup>Dept. of Biology, Columbus State University, Columbus, GA 31907 and <sup>2</sup>Biology Dept., Pacific University, Forest Grove, OR 97116—Georgia Distributions & Habitat Characteristics of *Procambarus (Ortmannicus) acutissimus* and *P. (O.) verrucosus*.

Survey collections from Georgia drainages of the Chattahoochee River have expanded the eastern range of *Procambarus acutissimus* from Hobbs (1981) single locality in Quitman County to three watersheds in west Georgia. Searching for *P. acutissimus* resulted in the discovery of a new Georgia species, *P. (O.) verrucosus*. *P. acutissimus* is found in three tributaries, ranging south from Harris through Muscogee and Chattahoochee Counties. Its range is disrupted, in three tributaries, by *P. verrucosus* in Chattahoochee and Stewart Counties, and then resumes and appears to terminate in Stewart County. This is a puzzling distribution pattern for such closely related species found in similar appearing wetland habitats. Comparative studies of the habitats of the two species suggest that characteristics associated with pH may constitute the most important differences between their habitats. Continued attention to these species is justified and recommended because they may be appropriate candidates for protection in Georgia, they may be candidates for aquaculture as fish bait, and they may be useful indicators of wetland integrity. Supported, in part, by the Georgia DNR Non-Game Species Program.

152. BATTAGLIA, L. L.<sup>1</sup> AND B. S. COLLINS<sup>2</sup>. <sup>1</sup>Dept. Biological Sciences, Louisiana State University, Baton Rouge, LA 70803 and <sup>2</sup>Savannah River Ecology Laboratory, University of Georgia, Aiken, SC 29802. —Linking patterns: hydroperiod and vegetation in Carolina Bay wetlands.

Typical Carolina bays are elliptical depressions surrounded by upland forest matrix in the Atlantic Coastal Plain. They range from pond-like wetlands, characterized by stable hydroperiod, to flashy wetlands that respond quickly to rainfall events and can dry during



summer. Bay plant communities are influenced primarily by spatial and temporal variation in hydrology, but the effects of these filters on propagule bank expression in vegetation patterns are not well understood. We examined the relationships among hydrologic variation, recruitment from the propagule bank, and extant vegetation over one season in six herbaceous Carolina bays that differ in hydroperiod and basin shape. Stable hydrology in bays with steep basins produces zoned vegetation with patch-like characteristics. In contrast, flashy hydrology, typical of more shallow basins, causes periodic "reshuffling" of the vegetation, and produces gradual changes in species composition with a greater contribution from the seedbank. We suggest a model in which these scenarios represent two extremes of organization in depression wetlands; between the extremes, vegetation and propagule banks can exhibit both patch-like and gradient-like characteristics in response to the pattern of hydrological variation.

153. SAUTERER, ROGER., CORRINE MULLIGAN, AND JAMES RAYBURN. Department of Biology, Jacksonville State University, Jacksonville, AL 36265.- Research plan and preliminary analysis of water and sediment extracts from Choccolocco Creek, AL, by the FETAX developmental toxicity assay.

Choccolocco Creek is contaminated by a Monsanto plant in Anniston, AL, which allowed PCBs from a waste dump to run off into Snow Creek, a tributary of Choccolocco Creek. Because of PCB contamination there are no fish consumption advisories along the entire creek and residents near the Monsanto plant, a Superfund site, have elevated PCB levels in their blood. In order to assess the potential developmental toxicity of Choccolocco Creek waters and sediments using a model organism under laboratory conditions, water and sediment extracts from three study sites, one on Snow Creek 1 km from the Monsanto plant, one near the Snow Creek /Choccolocco Creek merger, and one 40 km downstream near Logan Martin Lake were assayed by the FETAX developmental toxicity assay. The FETAX assay is a standardized assay involving incubation of *Xenopus* (frog) gastrulating embryos in test solutions and examining them for mortality, growth, and malformations at the end point. Preliminary data obtained to date indicates statistically significant increases in embryonic growth and some non-significant increases in mortality. These sites will be further examined by the FETAX assay and by gas chromatography to determine PCB contamination and correlate it with developmental toxicity.

154. Reaves, Jared W. Naval Research Lab 4555 Overlook Ave, SW Washington DC 20375-5320 -- The Examination of Solid Phase Extraction Matrices for the Removal and Concentration of TNT in Seawater

We report on the use of solid phase extraction (SPE) matrices for the removal and concentration of 2,4,6 trinitrotoluene (TNT) in seawater. Three different SPE matrices were evaluated for consistency and efficiency. Four experimental methods were used to determine the percent extraction for TNT. HPLC analysis was performed using Method 8330 to determine the TNT concentration and extraction efficiency. Seawater samples containing TNT (1000ng) were applied to the SPE matrix. A trace sample of TNT (1000ng) was also applied to the Nexus SPE Cartridges. The HPLC results showed that the Nexus matrix gave the most consistent results compared to the All-Tech SPE cartridges and the SPE membranes however, some results exhibited greater than 100% extraction efficiency. Increased extraction efficiency was possibly the result of differences in explosive standard calibration and unknown sample.

155. GEORGE R. CLINE AND FRANK A. ROMANO, III, Biology Dept., Jacksonville State University, Jacksonville, AL, 36265-1602 – Response characteristics of the Shannon-Weiner diversity index.

Species diversity measures the biological complexity of a community. Two components of species diversity, species richness and species evenness, are measured separately or in a combined index. One commonly used index is the Shannon-Weiner Index ( $H'$ ). This index



combines the species richness and species evenness components of diversity into a single value. Conventional 'wisdom' regarding  $H'$  is that it ranges from zero to infinity, and that it is sensitive to changes in the number of species and the relative distribution of rare species. Using a series of hypothetical communities, we explore the responses of the Shannon-Weiner index to test this conventional wisdom. We report that while the index does theoretically range from zero to infinity, the upper limit for  $H'$  for any sample with  $s$  species is equal to the log of the number of species. Furthermore, if we sequentially remove one individual from a species until that species is removed from the community, we find that  $H'$  first decreases to a minimum that asymptotes on the log  $(s-1)$ , before climbing towards Log  $(s)$ . Finally, we explore the impact of these limitations on the degree of saturation in a community, and the practical implications on ecological studies.

156. BEECH, CAROLYN D. AND STEPHEN C. LANDERS. Department of Biological and Environmental Sciences, Troy State University, Troy, Alabama 36082–  
Seasonal fluctuations of sessile ciliated protozoa from Dauphin Island, AL.

This project has examined the seasonal cycle of sessile ciliated protozoa in the Mississippi Sound with a focus on the environmental factors that influence their populations over an eighteen-month period. Protozoan samples were collected monthly along with the following data: air and water temperature, nitrate and phosphate levels, salinity, turbidity, dissolved oxygen, and pH. Glass slides were used to collect attached ciliates at three locations along the north side of Dauphin Island. The dominant genera that colonized the substrates after one week of submersion were the suctorians *Acineta* and *Ephelota*, and the peritrichs *Cothurnia*, *Vaginicola*, *Vorticella*, and *Zoothamnium*. These six genera constituted 90% of the census at any given site or collection period during the study. A statistical comparison of population size to many environmental factors has shown a significant link between temperature and colonization. Total population numbers of the above mentioned genera declined to near zero by January 2000 as the water temperature dropped into the low teens and then slowly began to rise again in the spring with a corresponding rise in water temperature. The maximum protozoan density following seven days of colonization was 6986 cells/cm<sup>2</sup>. Support was provided by the Alabama Department of Public Health ALERT grant.

157. PARSONS, A. CAROL , JONATHAN M. WILLIS, and GARY P. SHAFFER. Department of Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402-Findings of the feasibility study of a freshwater diversion into the Lake Maurepas swamp in Southeastern Louisiana - Part II: Herbaceous vegetation

In Louisiana, freshwater river diversions have been proposed as a tool for restoration of degraded wetlands. To investigate the potential benefits of a freshwater river diversion into the degraded wetlands associated with Lake Maurepas in southeastern Louisiana, an experiment with a 20 x 2 x 2 split plot treatment arrangement was designed. The experiment contains 20 sites, 2 stations at each site, and 2 nutrient levels. Percent herbaceous cover and clip plots were performed in the Spring and Fall of 2000. In addition to vegetation data, soil cores and bulk density cores were collected to determine relevant soil parameters. Both percent cover and species richness were highest in the Spring. As basal diameter of the forest canopy increases, percent cover decreases. Fertilizer doubled productivity, but did not decrease species richness. Our data indicates a diversion would not exceed the assimilative capacity of the wetlands, thus it would not be expected to cause algal blooms in Lake Maurepas. Our research suggests that a freshwater river diversion would be very beneficial to the wetlands of the Southern Maurepas. Without this river diversion, more than half of the existing wetlands are expected to degrade to open water in the next 5 decades.

158. HANEY, D.C.<sup>1</sup>, A. MITCHUM<sup>1</sup>, W.B. WORTHEN<sup>1</sup>, C.B. ANDERSEN<sup>2</sup>, AND J. WHEELER<sup>3</sup>. <sup>1</sup>Biology Dept., <sup>2</sup>Earth and Environmental Sciences Dept., and <sup>3</sup>Chemistry Dept., Furman University, Greenville, SC 29613-Effects of land use on fish diversity and abundance in the Enoree River, SC.

We compared the chemistry and biology of four tributaries of the Enoree River in upstate South Carolina: Brushy Creek, Durbin Creek, Kings Creek, and Indian Creek. Kings and Indian Creek are relatively undisturbed and flow through rural areas in Sumter National Forest. Brushy Creek flows through a highly disturbed residential area while Durbin Creek is a mix of urban and rural landscape. With respect to water chemistry parameters, Kings Creek and Indian Creek differed most from the more urbanized Brushy Creek, with Durbin Creek intermediate in most cases. Turbidity, dissolved organic carbon, calcium, magnesium, bicarbonate, and silica were high in Kings and Indian Creeks, while low in Brushy Creek. Durbin Creek, although intermediate for most parameters, had the highest chloride, nitrate, and phosphate levels. These chemical patterns correlate with several biological descriptors. Durbin and Indian Creek had the greatest fish abundance and diversity, with Brushy and Kings Creek the lowest. Interestingly, benthic fishes in the genus *Etheostoma* were virtually absent from Brushy Creek, but high in Kings Creek. The results of this research suggest that varying land use can have a significant impact on the water chemistry and biota of freshwater streams.

159. WALTERS, DAVID M.<sup>1</sup>, MARY C. FREEMAN<sup>1</sup>, DAVID S. LEIGH<sup>2</sup>, BYRON J. FREEMAN<sup>1</sup>, MICHAEL J. PAUL<sup>1</sup>, AND CATHERINE M. PRINGLE<sup>1</sup>. <sup>1</sup>Institute of Ecology and <sup>2</sup>Department of Geography, University of Georgia, Athens, GA 30602. -Geomorphology, land cover, and water quality as indicators of fish biotic integrity in the Etowah River system.

We assessed fish assemblages, habitat, and watershed characteristics for Etowah River tributaries in Georgia. Our goals were to determine (1) which geomorphic, land use, and water quality variables correlate with biotic integrity and (2) if biotic integrity decline is linear along a disturbance gradient. Index of biotic integrity (IBI) scores were most strongly related to stream slope ( $r = 0.8$ ). At the watershed scale, % tree cover ( $r = 0.65$ ) and % urban land use ( $r = -0.60$ ) were the best predictors. Among water quality variables, ammonium ( $\text{NH}_4$ ), total suspended solids (TSS), and turbidity (NTU) were the strongest predictors and were negatively correlated with IBI score. All five variables explained a significant amount of the variance ( $p$  values  $< 0.05$ ) in the IBI versus slope model. A stepwise regression model using slope, % urban land cover and  $\text{NH}_4$  concentration explained 89% of the variance in IBI scores. Bivariate plots illustrated nonlinear relationships between IBI scores and disturbance. For example, the plot of turbidity vs. IBI score showed an apparent threshold of approximately 10 NTU. Sites averaging  $> 10$  NTU seldom scored higher than 35 (out of 100) and tended to have larger negative residuals in the slope/IBI regression.

160. KNAPP, N.<sup>1</sup> AND B. LAPOINTE<sup>2</sup>. <sup>1</sup>Dept. of Biology, Furman University, Greenville, SC 29613 and <sup>2</sup>Harbor Branch Oceanographic Institution, Fort Pierce, FL 34946-Nutrient enrichment, macroalgal biomass, and sea urchin density on the Sabellariid worm reefs along a latitudinal gradient in Southeast Florida.

We assessed the environmental health of the Indian River Lagoon Region's Sabellariid worm reefs at five locations from Sebastian to Palm Beach, FL. Macroalgal collections and sea urchin density counts were taken. Water samples were analyzed for concentrations of DIN (DIN = ammonium + nitrate + nitrite) and SRP (SRP = soluble reactive phosphate). Snorkelers assessed the benthic community structure of six reefs using an underwater video camcorder. The highest mean macroalgal biomass was found at Rio Mar (108.7 g dry wt·m<sup>-2</sup>), followed by Ambersand (84.3 g dry wt·m<sup>-2</sup>). The mean sea urchin density correlated positively with the macroalgal biomass among the five sites ( $p=0.03$ ). The highest worm cover was at the Fort Pierce Inlet State Park at 73% cover. Bathtub South had 51.5% worm cover, yet Bathtub North

was only 4% cover, the lowest of all six sites. The sites were nitrogen-limited with DIN:SRP ratios <10. The DIN and SRP concentrations exceeded 1.0  $\mu\text{M}$  and 0.1  $\mu\text{M}$ , respectively, above which explosive macroalgal growth can occur at all of the study sites except Bathtub South. Results of this study show that macroalgal biomass and sea urchin densities have increased as a result of coastal eutrophication.

161. BARNETT, KIRK G., MICHAEL L. LITTLE, AND DONALD C. TARTER, Department of Biological Sciences, Marshall University, Huntington, WV 25755-Analyses of mtDNA and morphometrics of *Gambusia* sp (Pisces: Poeciliidae) in the Green Bottom Wildlife Management Area, West Virginia.

Prior to 1988, two subspecies of the mosquitofish *Gambusia affinis* (*G. a. affinis* and *G. a. holbrooki*) were recognized in the warm southern waters along the Gulf and Atlantic coasts of the United States. Based upon electrophoretic and morphometric analysis in 1988, *G. holbrooki* and *G. affinis* were determined to be distinct taxa. Populations west of Mobile Bay, Alabama, were established to be *G. affinis* and those east of Mobile Bay to be *G. holbrooki*. Only two populations of mosquitofish have been found in West Virginia: the Meadow River wetlands, Greenbrier County and the Green Bottom Wildlife Management Area, Cabell and Mason counties. Analyses of the cytochrome *b* region of mitochondrial DNA using polymerase chain reaction were performed on the West Virginia populations to determine appropriate classification. Mitochondrial DNA analysis as well as multivariate analysis of ten morphometric and meristic characters indicate that the Green Bottom population is a phenotypic variant of *G. affinis*.

162. BLAKE, JAMIE<sup>1</sup>, THOMAS JONES<sup>2</sup>, JOHN ENZ<sup>3</sup>, AND DONALD TARTER<sup>1</sup>.  
<sup>1</sup>Department of Biological Sciences, Marshall University, Huntington, WV,  
<sup>2</sup>Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV and <sup>3</sup>Department of Biology, Alderson-Broaddus College, Philippi, WV-The benthic communities found downstream from valley fills in southern West Virginia.

A number of permit applications for mountain-top removal within West Virginia prompted the USEPA to develop an Environmental Impact Statement (EIS) prior to release of the permits. That study resulted in the collection of benthic macroinvertebrate samples, water quality, fish community data, and habitat data to be collected from reference and experimental sites. The experimental sites were located downstream from valley fills that ranged in age from current filling to fills that were 30 years old. A subset of the sites included Surber sampling, as well as kick sampling. The samples were collected for four seasons from summer of 1999 to the spring of 2000. Six Surber samples were collected from each site. All macroinvertebrates were identified and enumerated to the lowest possible taxon with the exception of chironomids and oligochaete. The Surber diversity ranged from 5 to 46 taxa. Principle component analysis (PCA) exhibited strong seasonal and site clustering. Numerous outliers were identified and can be explained using water quality and/or habitat data. Several sites exhibited shifts in community structure especially below the settling ponds. A few pre-reclamations sites exhibited significant structural changes that remained throughout this data set. A general trend to more reference-like community structure was apparent with increasing valley fill age.

163. DOLIN, ROBIN E. AND DONALD C. TARTER. Department of Biological Sciences, Marshall University, Huntington, WV 25755-Preliminary observations on the natural succession of benthic populations in constructed sediment ponds in southwestern West Virginia.

Surface mining of coal involves removing overlying soil and rock in order to explore the coal seam below. In some types of surface mining, the overburden is placed into nearby valleys that typically contain headwater for small streams. A critical feature of strip-mine ecology is the

massive erosion and subsequent sedimentation in these streams. The amount of sediment flowing downstream in a valley fill can be controlled by sedimentation ponds. Seasonal benthic populations from kick samples (1m<sup>2</sup>) were examined from three sedimentation ponds of various ages. Also, data from Hester-Dendy multiplate samplers (3) and gravel basket samplers (3) were used to compare benthic populations with kick samples from three additional sediment ponds. Benthic taxa were grouped according to the following pollution indicator classification: sensitive, facultative, tolerant, and unclassified. The Bray-Curtis similarity index, total density, taxa richness, evenness, and the Shannon diversity index were also used to compare benthic populations among ponds. Several water quality parameters (total alkalinity, acidity, sulfate, aluminum, iron, manganese, total suspended solids, total dissolved solids, and pH) were measured at each pond. Preliminary observations indicated that chironomid larvae (tolerant taxon) ranked first in percentage frequency of occurrence. Odonate taxa (tolerant) were also abundant.

164. RAYNER, DOUGLAS A. Wofford College, Spartaburg, SC 29306-Where have all the wildflowers gone? Effects of deer browse on spring wildflowers in Croft State Park, South Carolina.

Qualitative and quantitative data obtained from a nine-year-old deer enclosure and from 34 additional sites in the 7054-acre Croft State Park document the devastation of the herbaceous flora by the browsing of white-tailed deer. Qualitative data indicate that virtually all spring wildflowers have been severely impacted and that some rare or unusual piedmont species either have been extirpated from the Park (*Cypripedium parviflorum* var. *pubescens* and *Hexaletris spicata*) or reduced to just a few stems (*Liparis lilifolia*, *Orchis spectabilis*, and *Malaxis unifolia*). Quantitative data for *Trillium catesbaei*, *Sanguinaria canadensis*, and *Podophyllum peltatum* indicate the degree to which abundance, size, and stage class have been affected. For example, only 918 stems of *T. catesbaei* were found in the entire Park in the year 2000 and 18 percent of these were found in a single 100m<sup>2</sup> deer enclosure; trillium abundance was 68 times greater in the enclosure than in similar habitats in the Park as a whole. Documentation is provided on the recovery of *T. catesbaei* and *S. canadensis* nine years after protection from deer browsing, as well as their continued decline in the absence of protection. Discussion includes what has been done about over-browsing in Croft State Park and what needs to be done to recover the spring wildflower flora.

165. BEYERL, TAMMIE R. and DAVID J. GIBSON. Department of Plant Biology, Southern Illinois University, Carbondale, IL 62901-6509 - Habitat and life history characteristics of *Dioscorea oppositifolia* L., an invasive exotic plant species in southern Illinois.

*Dioscorea oppositifolia* is an invasive exotic that is an increasing problem in natural areas in southern Illinois. This species has the potential to spread rapidly through the production of axillary tubers called bulbils. These bulbils are modified stems that are produced in the leaf axils. Each vine can produce numerous bulbils and each bulbil has the potential to produce a new plant. Very little is known about the ecology of this species as an escape. We conducted a study to determine the habitat of *D. oppositifolia* in southern Illinois and to establish some of its life history characteristics. The most common habitat was riparian corridors and roadsides. Vines produced an average of 20 bulbils, average vine length was 77.6cm, and average total biomass was 2.98g. We also conducted a plant species diversity survey and determined that plant diversity was higher in plots without *D. oppositifolia* (mean number of species = 6.9,  $\pm 1.6$ ) than in plots with *D. oppositifolia* (mean number of species = 4.6,  $\pm 2.7$ ). Knowledge of the species life history is crucial to assessing its potential to spread and threaten native ecosystems. It is also important for the development of control methods.

166. CHANDY, SHIBI<sup>1</sup> AND DAVID. L.EULER<sup>2</sup>; 2000. <sup>1</sup>Department of Plant Biology, Southern Illinois University at Carbondale Illinois 62901 USA. and <sup>2</sup> Faculty of Forestry, Lakehead University, Thunder Bay, Ontario P7B 5E1 Canada.- Impact of silviculture on four medicinal plants in Northwestern Ontario.

Vegetation management to release conifers from competing angiosperms is practiced throughout Canada. Aerial herbicide application, mechanical cutting, and site preparation are some of the techniques used to suppress competing vegetation. These techniques allow conifers to establish in the first few years after planting. One of the issues that arise, especially from the public, is concern that aerial herbicide applications have on other values. Hence, there is pressure on managers to find alternatives for the chemical control of vegetation that hinders early conifer growth. The abundance of (*Cornus stolonifera* Michx., synonym *serecia*), (*Epilobium angustifolium* L), (*Pteridium aquilinum* (L.) Kuhn), and (*Rubus ideas* L.var.*stringosus* (Michx).Maxim) was determined, seven years after the silvicultural treatments were first applied in the area. All four species studied show potential medicinal ingredients both from ethnobotanical, and pharmaceutical perspectives. A single application of herbicides or mechanical treatments did not show any statistical difference from the control plots in the abundance of these species. By using mechanical methods for controlling these species, the medicinal values can be made available for development by the pharmaceutical companies, without contributing to any environmental degradation that may result from aerial herbicide application.

167. SOUZA, LARA<sup>1</sup>, ART H. CHAPPELKA<sup>2</sup>, AND HOWARD S. NEUFELD<sup>1</sup>. <sup>1</sup>Department of Biology, Appalachian State University, Boone, NC 28608 and <sup>2</sup>School of Forestry, Auburn University, Auburn, AL 36849-5418. – Seasonal development of ozone-induced foliar injury in tall milkweed (*Asclepias exaltata*).

Tall milkweed (*Asclepias exaltata*) is a common herbaceous plant that grows in moderately shaded habitats in the southern Appalachians. It is also one of the most ozone sensitive wildflowers known. This study was designed to investigate the seasonal pattern of foliar injury development in this species. Four populations were monitored: Mt. Sterling Gap and Thomas Divide Trail (Great Smoky Mountains National Park) and two sites on the Blue Ridge Parkway (Moses Cone Manor and near Linville). Foliar symptoms were observed at biweekly intervals in the Smokies and twice in late summer on the Parkway. Chlorosis, necrosis and purpling were minimal for most leaves early in the season, but increased beginning in mid-July. Upper leaves were most affected. Across all populations, 72% of the individuals were rated sensitive, and injury severity was similar among populations. Why injury developed only in late summer is curious, since ozone concentrations were higher early in the season. Seasonal changes in stomatal conductance and anti-oxidant activity may be responsible. We plan to expose sensitive and tolerant genotypes to ozone to test these ideas.

168. LUKEN, JAMES O. AND PHILLIP W. VALENTINE. Dept. of Biological Sciences, Northern Kentucky University, Highland Heights, KY 41099. -Inundation frequency and development of forest communities adjacent to flood-control reservoirs.

Few data are available on the plant communities now occurring on the shorelines of flood-control reservoirs. We studied six flood-control reservoirs in Kentucky, Ohio and Indiana during late summer, 2000 and assessed forest communities in three flood-frequency zones: frequent, moderate, and infrequent. These zones were identified using the long-term database maintained by the U. S. Army Corps of Engineers. Community-level changes were most obvious in the zone of frequent flooding. Here, community changes ranged from declines in basal area and tree density to replacements of flood-intolerant species by flood-tolerant species. Effects of historical flooding were most pronounced in reservoirs with histories of relatively high water fluctuations and relatively high numbers of days when the water was in a particular flood-frequency zone.

169. BENNETT, HOLLY H., ALVIN R. DIAMOND, AND MICHAEL WOODS. Department of Biological and Environmental Sciences, Troy State University, Troy, AL 36082-Insect visitors to *Warea sessilifolia* Nash.

Understanding the ecology of rare species is important for their preservation. The pollination ecology of *Warea sessilifolia* Nash. (Brassicaceae) was studied using an insect exclusion technique. Prior to floral maturity, inflorescences were "bagged" with nylon cloth to prevent potential pollinator access. During the flowering period, plants were monitored for two-hour intervals at various times during the day. All insect visitors were collected and identified. In an attempt to determine the peak time for insect visitation, data, including time and weather conditions were recorded for each insect collected. In the laboratory, with the aid of a dissecting microscope, the amount of pollen on each insect was quantified to determine primary pollinators. Of the fourteen insect families collected, only four were considered primary pollinators. Viable seed production on the "bagged" inflorescences suggests that *Warea sessilifolia* is capable of self-pollination.

170. Walker, G. L.<sup>1</sup>, D. W. Larson<sup>2</sup>, U. Matthes<sup>2</sup>, and K. Graham<sup>1</sup>. <sup>1</sup>Dept. of Biology, Appalachian State University, Boone, NC 28608 and <sup>2</sup>Dept. of Botany, The University of Guelph, Guelph, Ontario, Canada, N1G 2W1. -The occurrence of ancient forests on cliffs, regionally and globally.

Cliff-face populations of northern white cedar (*Thuja occidentalis* L.) have been described in the main range of this species and in their southern disjunct range in the southern Appalachians. A relict community of other boreal associate plant species have likewise been described in the southern disjunct range. These disjunct and main range cliff-face communities represent ancient, slow-growing forests with some individuals in excess of 1000 years in age. These undisturbed ancient woodlands are found on cliff faces globally. This paper describes the southern Appalachian cliff-face boreal relict communities and addresses the similarities to those found on the Niagra Escarpment of Ontario, Canada. In addition, these ancient forests on cliffs are characterized from a global perspective..

171. GALBRAITH, SHANNON L. AND WILLIAM H. MARTIN. Division of Natural Areas, Eastern Kentucky University, Richmond, KY 40475-Three decades of change in an old-growth forest, Lilley Cornett Woods, Kentucky.

Lilley Cornett Woods is an old-growth mixed mesophytic forest on the Cumberland Plateau in Letcher County, Kentucky. Overstory and understory trees have been periodically surveyed in permanent plots since 1971. Objectives of this 1999 study included (1) an assessment of tree species and community composition, and (2) documentation of any significant changes in vegetation and species over a 28-year period. Contrary to studies in other old-growth forests, overstory density (284 to 347 trees/ha) and basal area (26.4 to 29.9m<sup>2</sup>/ha) have significantly increased from 1971 to 1999. The total number of overstory and understory species has remained relatively stable during this time. *Fagus grandifolia* remains the most important overstory tree species, and six species (*Fagus grandifolia*, *Tsuga canadensis*, *Acer rubrum*, *Quercus alba*, *Acer saccharum*, *Quercus pinus*) have comprised over 60% of total importance values in the forest since 1971. However, there have been significant overstory and understory increases in importance of maples and eastern hemlock and decreases in some oaks. This trend of increasing importance of maples with a decrease in oaks is consistent with other reports in the Southern Appalachians.

172. WELTZIN, JAKE F.<sup>1</sup> AND RICHARD J. NORBY<sup>2</sup>. <sup>1</sup>Dept. Ecology and Evolutionary Biology, University of Tennessee, Knoxville, TN 37996 and <sup>2</sup>Oak Ridge National Laboratory, Oak Ridge, TN 37831. -Global change and biological invasions: response of understory invasive plants to elevated CO<sub>2</sub>.



Increases in the concentration of carbon dioxide ( $[CO_2]$ ) in the atmosphere, and invasions by non-native organisms, are both predicted to change plant communities and ecosystems in the near future. Because interactions between these two variables may be greater than their individual effects, we are investigating the response of non-native, invasive plants to elevated  $[CO_2]$  in an ongoing, free-air  $CO_2$  exposure (FACE) facility on the Oak Ridge National Environmental Research Park, Tennessee. Five 25-m diameter plots within a stand of sweetgum (*Liquidambar styraciflua*) have received either ambient (= control) or elevated (537 ppm)  $[CO_2]$  since 1998. In Fall 2000, we clipped subplots within each plot to determine biomass of non-native, invasive woody plants (*Lonicera japonica*, *Ligustrum sinense*), an invasive, annual  $C_4$  grass (*Microstegium vimineum*), and other taxa. Total understory biomass did not differ between ambient and elevated treatments ( $194 \text{ g/m}^2$ ;  $P = 0.25$ ). Similarly, biomass of invasive woody plants did not differ ( $140 \text{ g/m}^2$ ;  $P = 0.39$ ). However, production of *M. vimineum* was greater in the ambient ( $82 \text{ g/m}^2$ ) than elevated ( $58 \text{ g/m}^2$ ) treatments. Results suggest that factors other than  $CO_2$ , such as disturbance or light availability, may dictate at least the proximal response of invasive plants to increasing atmospheric  $[CO_2]$ .

173. SELLARS, JON D., AND CLAUDIA L. JOLLS. Department of Biology, East Carolina University, Greenville, NC 27858. Critical knowledge for the restoration of seabeach amaranth, *Amaranthus pumilus*.

Seabeach amaranth (*Amaranthus pumilus* Raf., Amaranthaceae) is a federally threatened annual flowering plant of Atlantic coastal dunes, once distributed from Massachusetts to South Carolina. Now extirpated from two-thirds of its historical range due largely to habitat degradation and destruction from development, the 1996 recovery plan calls for restoration efforts. This annual reproduces exclusively by seed; thus, persistence of populations and restoration is dependent upon successful seed production, germination and plant establishment. We asked whether site location, size of juvenile and date of planting affected success of transplants in a preliminary step towards developing restoration protocols for seabeach amaranth. We assessed two size classes (6 vs. 9 wk) and three planting dates (mid-April, mid-May and mid-June). Juveniles were reared from seed in the laboratory and transplanted to three sites selected using light detection and ranging (LIDAR) at Cape Hatteras National Seashore, NC. Survival was typical of other dune taxa (30%); 100% mortality occurred at one site due to early season storms. Both size and date were highly significant predictors of transplant survival. Our results suggest June plantings of larger individuals can result in successful seed set and possibly population restoration. Support from the NCDA Plant Conservation Program is gratefully acknowledged.

174. ZETTLER, LAWRENCE. W., ERIN L. MAXWELL, AND SCOTT L. STEWART. Department of Biology, The Illinois College, Jacksonville, IL 62650 - Do herbarium specimens harbor viable orchid seeds and mycorrhizal fungi for use in conservation?

The ongoing worldwide destruction of orchid habitats has prompted an urgent need to rescue seeds and mycorrhizal fungi for endangered species recovery programs and habitat restoration projects. Because reliable seed germination methods have not been developed for most taxa, it is likely that herbaria will harbor a number of species that no longer exist in the wild. Conceivably, herbarium specimens with mature capsules and root-like organs could be of importance to conservation as a source of seed and mycorrhizal fungi, respectively, if they remain viable in storage. This possibility was the focus of our study. Seeds of *Govenia floridana*, one of the rarest species in the U.S., were obtained from a Harvard University Herbarium (AMES) specimen collected in 1957. Seeds were sown *in vitro* and inoculated with mycorrhizal fungi (=symbiotic seed germination). Root samples were removed from four Illinois College Herbarium specimens: *Epidendrum conopseum* (collected in 1995), *Goodyera repens* (1895), *Orchis spectabilis* (1890), and *Platanthera integrilabia* (1995). Roots were soaked in DI water and plated on modified Melin-Norkrans agar (MMN). All four orchids harbored intact pelotons - coils of fungal hyphae in cortical cells - but none of the pelotons initiated growth in



the medium. Seeds of *G. floridana* failed to germinate, suggesting that herbarium specimens may be of little use to orchid conservation.

175. STEWART, SCOTT L.<sup>1</sup>, LAWRENCE W. ZETTLER<sup>1,2</sup>, MARLIN L. BOWLES<sup>2</sup> AND KAREL A. JACOBS<sup>2</sup>. <sup>1</sup>Department of Biology, The Illinois College, Jacksonville, IL 62650, <sup>2</sup>The Morton Arboretum, Lisle, IL 60532 - Symbiotic seed germination and mycorrhizal fungi of a Federally-threatened orchid, *Platanthera leucophaea* (Nuttall) Lindley.

The steady decline of the eastern prairie fringed orchid, *Platanthera leucophaea*, has prompted concern for its recovery through artificial propagation. We describe a technique to germinate seeds and cultivate seedlings of this Federally-threatened orchid *in vitro* using cold treatments (=stratification) and mycorrhizal fungi (=symbiotic seed germination). Five fungal isolates were recovered from the root-like organs of mature *P. leucophaea* plants in Illinois and Michigan and were identified as members of the anamorphic genus *Ceratorhiza* Moore. Stratified seeds inoculated with mycorrhizal fungi germinated within 25 days of sowing. Leaf-bearing seedlings were obtained by chilling young seedlings (protocorms) for 107 days. Our successful culture of leaf-bearing seedlings with a presumed mycotrophic capability is a highlight of this study because it may now be possible for seedlings of this threatened species to be established on soil *ex vitro*, followed by reintroduction into suitable habitats.

176. SHARMA, JYOTSNA<sup>1</sup>, L. W. ZETTLER<sup>2</sup>, J. VANSAMBEEK<sup>3</sup>, AND C. J. STARBUCK<sup>1</sup>. <sup>1</sup>Department of Horticulture, University of Missouri, Columbia, MO 65211, <sup>2</sup>Department of Biology, The Illinois College, Jacksonville, IL 62650, <sup>3</sup>North Central Research Station, USDA Forest Service, University of Missouri, Columbia, MO 65211 - Symbiotic seed germination *in vitro* of Federally-threatened *Platanthera praeclara* Sheviak and Bowles (Orchidaceae).

*Platanthera praeclara*, a terrestrial orchid native to midwestern prairies, exhibits a bimodal pattern of population sizes. Loss of populations from 75% of historic sites throughout the range and greater likelihood of extirpation in small populations makes artificial propagation from seed an urgently needed conservation tool. Symbiotic *in vitro* germination was evaluated to: (1) determine the relationship between population size and seed germinability; (2) identify the fungal isolate(s) that best aids germination; and (3) determine the optimal cold/moist pre-treatment (=stratification) period to maximize germination. Seeds from five populations from Minnesota and Missouri were pre-treated with two, four, and six months of stratification. Seeds were inoculated with three fungal isolates, each of the genera *Epulorhiza* and *Ceratorhiza* recovered from *P. praeclara*. Preliminary results indicate that seed viability and germinability were not positively correlated with size of the source population. Germination was improved by exposing seeds to longer stratification periods. Seedling growth was more rapid in plates inoculated with two isolates (cohabitation). Pre-treatment of seeds with six months of stratification combined with inoculation with seedling-derived isolates supports development of *P. praeclara* seedlings up to Stage 5 (leaf-bearing).

177. ROBERTS, ROLAND P. AND LOWELL URBATSCH. Dept. of Biological Sciences, Louisiana State University. Baton Rouge, LA 70803.-Phylogenetic investigations of the *Ericameria-Chrysothamnus* complex (Astereae, Asteraceae) based on nuclear ribosomal ITS and ETS sequence data.

Inferred phylogenetic relationships based on DNA sequence data from representative taxa of the *Ericameria-Chrysothamnus* complex are not entirely in keeping with existing assumptions but provide the basis for additional hypotheses. For example, in an analysis of nrDNA ITS data *Chrysothamnus viscidiflorus*, the type for the genus, and a few other species of *Chrysothamnus* form a clade that includes *Chrysoma*, *Oligoneuron*, and *Solidago* spp. *Sericocarpus* is sister to this lineage. Certain other species of *Chrysothamnus* are included in a separate clade with

*Ericameria*, *Pentachaeta*, *Ragiopappus*, and *Tracyina* are sister to the *Ericameria* clade. *Xylothamia*, once thought to be closely allied with *Solidago*, forms a clade with *Bigelowia*, and representative taxa of *Euthamia*, *Gutierrezia* and *Gymnosperma*. Furthermore, *Xylothamia*, as traditionally constituted, appears to be polyphyletic with species representing two distinct lineages. ETS and ITS data reveal similar topologies. In addition, ETS data provide greater resolution of terminal taxa when analyzed independently and in combination with the ITS gene.

178. BRAY, REBECCA D. AND LYTTON JOHN MUSSELMAN. Department of Biological Sciences, Old Dominion University, Norfolk, Virginia 23529-0266-Quillworts of Virginia Revisited—Botanical discovery or taxonomic inflation?

The number of *Isoetes* from Virginia has more than doubled within the past 25 years. In 1960, Massey recorded six taxa; Harvill et al., 1992, listed four. Musselman and Knepper, 1994, seven. We consider the quillwort flora of Virginia to comprise: four diploids: *Isoetes engelmannii* A. Br., *I. mattaponica* L. J. Musselman and W. C. Taylor, *I. melanopoda* Gay and Durieu, and *I. valida* (Englem.) Clute; six tetraploids: *Isoetes acadiensis* L. Kott, *I. appalachiana* D. F. Brunton and D. M. Britton, *I. hyemalis* D. F. Brunton and D. M. Britton, *I. piedmontana* (N.E. Pfeiffer) C. F. Reed, *I. saccharata* Engelm., *I. virginica* N. E. Pfeiffer and a series three problematic populations from Chesterfield, Charles City, and York Counties; one decaploid: *Isoetes lacustris* L.; and four hybrids: *Isoetes ×altonharvillii* L. J. Musselman and R. D. Bray ( $n=22$ ), *I. ×bruntonii* D. A. Knepper and L. J. Musselman ( $n=33$ ), *I. ×cartaylorii* L. J. Musselman ( $n=33$ ), and a hexaploid hybrid involving *I. lacustris*, perhaps *I. ×fairbrothersii* J. D. Montgomery and W. C. Taylor ( $n=66$ ). This brings to 15 the number of named taxa in the state. The greatest taxonomic confusion is with the tetraploids. Recent research suggests that some tetraploid populations are paraphyletic.

179. WILLIAMS, CHARLIE. Public Library of Charlotte and Mecklenburg County, Charlotte, NC 28202. -Rediscovery of André Michaux's *Magnolia macrophylla* stations in North Carolina.

French Botanist André Michaux (1746-1802/3) discovered and named hundreds of plant species in North America. He reported *Magnolia macrophylla* from both TN and NC, but location of the NC stations had been forgotten. Michaux's journals, herbarium, other archival and modern sources were examined, and field study conducted, in order to relocate the site of his NC collections. This study has provided the impetus for additional research on the species and an international symposium on Michaux.

180. JONES, RONALD L. Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475. -The Andean Highlands of Ecuador--Notes on the Flora and Vegetation.

During a visit to Ecuador in June-July, 2000, a number of observations were made on the status of the flora and vegetation of the Andean Highlands. Several different regions were visited, including inter-Andean valleys, lower montane forest, cloud forest, and paramo. General floristic and vegetation differences were noted. According to recent estimates for Ecuador, the total species count for vascular plants is over 16,000, and about 10,000 of these species occur in the Andes. Active floristic studies are on-going in Ecuador, with about 15,000 new specimens collected each year. About 150 new species are described each year, the majority being endemics. Unfortunately, much of the original vegetation over vast areas of the Andes is now gone. The woody vegetation of the inter-Andean valleys is now largely exotic in origin. The Andean region has been declared the second most threatened ecosystem in the world, and major efforts are now underway to conserve what remains of the original biodiversity of these tropical mountain ecosystems. This opportunity was made possible through participation in the KUIS Ecuador Summer Program 2000, administered through Murray State University.

181. JONES, RONALD L. Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475. -The Galápagos Islands--Notes on the Flora and Vegetation.

During a visit to the Galápagos Islands in June, 2000, a number of observations were made on the status of the flora and vegetation. The following islands were visited: Santa Cruz, South Plaza, Bartolomé, and North Seymour. The floristic and vegetation differences among the islands were noted, including the vegetation zones, the conspicuous species, the rare and endemic species, and the introduced species. According to recent estimates the vascular flora now numbers over 850 species, with about 750 being flowering plants. Of the flowering plants, 216 are endemic to the Islands, and another 270 are considered native. The exotic flora has been estimated to be about 260 species, but the number is rapidly growing. Other threats to the Galápagos ecosystems include feral animals and introduced insects. Many studies are currently on-going, coordinated by the staff of the Charles Darwin Research Station. This opportunity was made possible through participation in the KILS Ecuador Summer Program 2000, administered through Murray State University.

182. URBATSCH, LOWELL<sup>1</sup>, PATRICIA COX<sup>2</sup>, AND RICHARD RUTH<sup>1</sup>. Louisiana State University<sup>1</sup>, Baton Rouge and the University of Tennessee<sup>2</sup>, Knoxville. -Is the central Florida endemic *Rudbeckia heterophylla* of "ancient" hybrid origin?

*Rudbeckia heterophylla* is restricted to Levy County Florida where it is locally abundant. It resembles the widespread, common *R. laciniata* with which it shares the feature of deeply lobed leaves and certain other characteristics. Although initially treated as a distinct species, it has been regarded for the past 50 or more years as a variety of *R. laciniata*. Spontaneous, garden hybrids between *R. auriculata* and *R. laciniata* resemble *R. heterophylla* in several morphological characteristics and suggest a hybrid origin for the latter. ETS sequence analyses reveals that the hybrids combine basepair differences of the parents in equal quantities. Morphological analysis together with DNA investigations should, therefore, provide useful tools in determining the probable phylogenetic origin of *R. heterophylla*. Preliminary results show that individuals from Levy County exhibit ETS sequence polymorphism frequencies lower than the garden hybrids but higher than ones typical for other sister species of *Rudbeckia*. The sequence data, therefore, tantalizingly hint at but inconclusively support a hybrid origin for *R. heterophylla*. The fact that *R. heterophylla* is completely allopatric from its sister taxa suggests that the putative hybridization had taken place in the distant past and that distributions at that time dramatically differ from the present. Additional sequence data are being sought from other genes to further test the hypothesis for *R. heterophylla*'s evolutionary origin.

183. MORETZ, C. CRAIG AND KATHLEEN A. KRON. Wake Forest University, Winston-Salem, NC 27109 – A phylogenetic study of *Elliottia* using molecular data from the nuclear ribosomal ITS region and chloroplast DNA genes: *matK* and *rbcl*.

The southeastern endemic, *Elliottia* (*E. racemosa*), has long been considered a monotypic genus. However, some workers have placed *Tripetaleia* (Japan - *T. paniculata* and *T. bracteata*) and the monotypic *Cladothamnus* (Pacific Northwest of North America - *C. pyroliflorus*) within *Elliottia* due to similarities in inflorescence and floral morphology. The phylogenetic relationships of these taxa were investigated in a parsimony analysis that also included 28 other members of the subfamily Ericoideae. Molecular data from the nuclear ribosomal internal transcribed spacer region (nrITS) and two chloroplast DNA genes: *rbcl* and *matK* were used to construct the data matrix. Results of our analysis indicate that *E. racemosa*, *T. paniculata*, *T. bracteata*, and *C. pyroliflorus* are a well supported clade (bootstrap = 98). Within this monophyletic group, *E. racemosa* and *C. pyroliflorus* are sister to each other (bootstrap = 97) and they are sister to the *T. paniculata* and *T. bracteata* group (bootstrap =

100). These results support the inclusion of the above four species in *Elliottia* but do not support an earlier hypothesis that *C. pyroliflorus* from the Pacific Northwest is more closely related to the Japanese species (*T. paniculata* and *T. bracteata*) than to *E. racemosa*. This study was partially supported by a Vecellio Grant.

184. HILL, STEVEN R. Illinois Natural History Survey, Champaign, IL 61820—The status of *Malvastrum hispidum* (Pursh) Hochr. (Malvaceae) in Illinois.

*Malvastrum hispidum*, the false mallow, is an annual warm-season herb, endemic to portions of the southeastern and central United States, that has been listed as threatened, endangered, or presumed extinct throughout most of its historic range. While it has been included within *Malvastrum* (Malvaceae), its ancestry, origins, and true relationships are obscure. Its preferred habitat is in thin soils in depressions over dolomitic limestone but the populations are discontinuous. Population sizes drastically vary each year depending on local conditions of rainfall and disturbance and its survival depends upon a persistent seedbank. The northernmost-known populations are in Illinois where the species is listed as endangered. Searches in 2000 found no individuals at isolated historic sites in LaSalle, Rock Island, and St. Clair counties but colonies in several dolomite prairie remnants in Will and Grundy counties were found to be large, with individuals in some areas numbering in the thousands. A precise determination of habitat requirements and community structure should help guarantee its survival. Support from the Illinois Wildlife Preservation Fund is gratefully acknowledged.

185. MICKLE, JAMES E.<sup>1</sup> AND MARIA ROSARIA BARONE LUMAGA<sup>2</sup>. <sup>1</sup>Dept. Botany, North Carolina State University, Raleigh, NC 27695 and <sup>2</sup>Orto Botanico, Università di Napoli, 80139 Napoli, Italy—Micromorphology of lycopod cuticles.

External surfaces of five species of lycopods, *Diphasiastrum digitatum*, *Huperzia lucidula*, *Lycopodiella alopecuroides* (Lycopodiales), *Selaginella kraussiana* (Selaginellales), and *Isoetes engelmannii* (Isoetales), were studied by SEM using standard techniques. *Huperzia lucidula* and *S. kraussiana* were obtained commercially; all others were field collected in North Carolina, USA. Stomata in all species are abaxial and in general the log axis is parallel to the long axis of the leaf. Stomata occur in narrow bands in *S. kraussiana* and *I. engelmannii*. Guard cell pairs in all species are ovoid, not sunken, and 18-55 µm long X 12-42 µm wide. Cuticular flanges extend from the guard cells over the stomatal aperture. Polar longitudinal ridges between guard cells occur in all species except *D. digitatum*. Epidermal cells in all except *S. kraussiana* are elongate to the leaf long axis, straight, smooth, and have oblique to square end walls. In *S. kraussiana* epidermal cells are sinuous and longitudinally striated. Stomatal uniformity within these species from various orders indicates that a generalized lycopod stomatal morphology occurs within this monophyletic group.

186. FLEMING, CHRIS A. University of Tennessee, Knoxville, TN 37996—Ethnobotany: rediscovering humanity's dependence on plants.

Ethnobotany, or the study of the plants and their uses, can now be thought of as a distinct branch of the natural sciences. The results of ethnobotanical studies affect our lives in many ways that people may or may not realize. To further explore this intriguing field, I spent the 1999-2000 academic year investigating the uses of plants in five Latin American countries (Ecuador, Peru, Guatemala, Belize, Honduras). The results of this study provided me with great insights into the uses of plants for foodcrops, medicines, utilitarian purposes, spiritual beliefs, and sustainable incomes. This talk will provide an overview of my experiences and observations and hopefully help people better understand our inherent reliance upon plants for survival.

187. MICKLE, JAMES E. North Carolina State University, Raleigh, NC 27695-  
Micromorphology of cycad cuticles.

Micromorphology of cuticles was examined in species of all genera of cycads except *Chigua*. Leaflets were obtained from greenhouses at Duke Univ., Ohio Univ., Università di Napoli, Italy, and Cycad Connections, Queensland, Australia. Cuticles were isolated in 20% chromic acid, air-dried on SEM stubs and coated to 30 nm with Au/Pd alloy. All species are hypostomatic and haplocheilic. Stomata vary widely in morphology but all species display polar extensions. Cuticular studies generally support current classifications *Cycas* is most similar to *Stangeria* and *Bowenia*, but supports *Cycas* being classified in a separate suborder. *Ceratozamia* and *Zamia* are similar in having a low cuticular flange surrounding guard cells, *Encephalartos*, *Macrozamia*, and *Lepidozamia* are similar in possessing a robust flange. Cuticles indicate that *Stangeria* is not as closely related to other species, including *Bowenia*, as suggested by recent classifications, suggesting that *Bowenia* and *Stangeria* may differ enough to be considered as separate families in a distinct suborder.

188. HURLBURT, GRANT R. Biological Sciences, Marshall University, Huntington, WV 25702-Maximum and relative brain mass in a size series of the American Alligator *Alligator mississippiensis*.

Relationships between brain mass (MBr) and each of body length (TL), snout-vent length to the anterior vent limit (SVLA) and body mass (MBd) are described for a sample of 16 American alligators (*Alligator mississippiensis*); MBd range of 11 to 277 kg, and a TL range of 1.6 to 3.8 m. Eight alligators were wild and 8 were raised in pens, including the eight of greatest mass. MBr was more highly correlated with each of TL ( $r=0.983$ ) and SVLA ( $r=0.981$ ) than with MBd ( $r=0.967$ ). The Coefficient of Variation for MBd was approximately 3 times that of TL, SVL, or MBr. MBr continued to increase with MBd and TL, falsifying the hypothesis that brain growth is determinate in alligators. The largest MBr was 10.71 for a seventeenth (wild) alligator of 3.8 m TL and unknown MBd (calculated as 206 kg). The longest reliably known wild alligator TL is 4.27 m. Extrapolating from the MBr-TL equation, its MBr was estimated as 11.3 g (95% prediction limits 7.45 to 14.14 g), and its estimated MBd is 343.1 kg, casting doubts on the widely used record of a 14.08 g brain in a wild 205 kg specimen (no TL data).

189. BLACKWELL, ERIC A.<sup>1</sup>, ROBERT A. ANGUS<sup>1</sup>, KEN R. MARION<sup>1</sup>, AND GEORGE R. CLINE<sup>2</sup>. <sup>1</sup>The University of Alabama at Birmingham and <sup>2</sup>Jacksonville State University-Growth of the spotted salamander (*Ambystoma maculatum*) in east-central Alabama.

The spotted salamander, *Ambystoma maculatum*, is a widespread species that occurs throughout the eastern United States into southern Canada. In January 1997 we initiated a long-term study of *A. maculatum* at a breeding pond in Calhoun County, Alabama. Individuals had PIT tags inserted for positive identification which allowed us to use the von Bertalanffy growth interval equation to estimate intrinsic growth rates for both males and females. For this population, females displayed a pattern of rapid juvenile growth, which slowed as they neared the estimated maximum size, but males displayed relatively constant growth until nearing their estimated maximum size. The intrinsic growth rate estimated for females was higher than that estimated for males. We hypothesize that females may be initially allocating more energy to rapid growth in order to mature earlier.

190. AUBREY E. DAVIS, JR., AND GEORGE R. CLINE, Biology Dept., Jacksonville State University, Jacksonville, AL, 36265-1602 – Survey of green salamanders (*Aneides aeneus*) in northern Alabama.

The green salamander, *Aneides aeneus*, is a denizen of rocky outcrops of the eastern United States. This salamander is a species of special concern throughout its range. Literature

reports are based heavily on individual sightings, with only occasional systematic efforts to analyze distribution. In July 1998, we began a survey of historic sites of green salamanders in northern Alabama. Eight counties were surveyed between July 1998 and the present. Twenty-three salamanders were observed from 12 sites in 6 counties. The maximum observed density was 4 salamanders at any given site and time. Conservation implications of these data are discussed.

191. LINDSAY, SHANE E. AND DORCAS, MICHAEL E. Davidson College, Davidson, NC 28036-Demography and habitat associations of pond dwelling turtles in the western piedmont of North Carolina.

Few studies have addressed intraspecific variation in life-history characteristics among habitats of varying quality. We used an extensive mark-recapture study to compare semi-aquatic turtle populations among twelve ponds with varying cattle impact in the vicinity of Davidson, NC. We compared turtles at a community level while testing for differences in morphology and reproduction among the ponds. We found considerable variation in species composition and relative abundances among the ponds. We also found that *Kinosternon subrubrum* (eastern mud turtle) size is inversely correlated with concentrations of nitrite/nitrate and ammonia and that *K. subrubrum* egg size is inversely correlated with concentrations of nitrite/nitrate and overall cattle impact. *Chrysemys picta* (painted turtle) morphology and egg size was not correlated with measured characteristics of water quality or with cattle impact. Other species captured in this study include *Chelydra serpentina* (snapping turtles), *Trachemys scripta* (sliders), and *Sternotherus odoratus* (musk turtles). While populations of these turtles were too small to allow statistical comparison, we did document several new county records for these species.

192. SWENSON, KIRBY C. AND GEORGE R. CLINE, Biology Dept., Jacksonville State University, Jacksonville, AL, 36265-1602-Responses of three salamander species to varying wavelengths of light.

This study examines the responses of *Notophthalmus viridescens*, *Ambystoma maculatum*, and *Desmognathus fuscus* in two-choice light vs. dark tests using varying wavelengths. The dominant wavelength bands used were; white, violet, blue, green, yellow, orange, and red. Animals were placed in a "Y"-maze and responses to the tests were recorded then analyzed using Chi Square analysis to examine differences in responses to light vs. dark, and ANOVA to examine differences in species responses to light among dominant bandwidths. The three species responded differently to varying wavelengths of light. *N. viridescens* exhibited significant negative phototaxis for white, blue, yellow, orange, and red. *A. maculatum* exhibited significant negative phototaxis for green, yellow, and white light, and *D. fuscus* exhibited significant negative phototaxis for violet light. Only *N. viridescens* displayed significant differences among dominant wavelengths. White light was avoided more than yellow, green, blue and violet light. Red and orange light were avoided more than green light. The most migratory species, *N. viridescens*, was the most negatively phototactic, while the least migratory species, *D. fuscus*, was the least negatively phototactic. These animals may use light as a migratory cue.

193. WOOTEN, JESSICA A. AND THOMAS K. PAULEY Marshall University, Department of Biological Sciences, Huntington, WV 25755-Distribution and morphological differences of *Desmognathus* in West Virginia.

There are five species of *Desmognathus* in West Virginia including *D. welteri*, *D. monticola*, *D. fuscus*, *D. quadramaculatus*, and *D. ochrophaeus*. West Virginia is geographically divided into north and south by the Kanawha/New River system. Populations that exist north of this river system, in some species such as *D. fuscus*, show distinct morphological differences. External morphological characteristics including presence of a mottled venter and size variation were

compared. Differences in tooth morphology were observed using the scanning electron microscope. Height, width at the base and crown, and general shape of teeth on the lower jaw and upper jaw were analyzed. Vomerine teeth were observed and compared within the genus.

194. TATUM, TATIANA C., GEORGE CLINE, MARK MEADE, CHARLES OLANDER, AND ROGER SAUTERER. Department of Biology, Jacksonville State University, Jacksonville, AL 36265. Observation of metabolic enzymes in two species of anurans.

Male anurans expend up to 25% more energy during the breeding season when calling compared to resting. Our study compared spring peepers (*Pseudacris crucifer*) and American toads (*Bufo americanus*) based on their species specific calls. As with all vertebrates, the tricarboxylic acid (TCA) cycle is an important component of metabolism. Activities of TCA enzymes including citrate synthase (CS), isocitrate dehydrogenase (IDH), and malate dehydrogenase (MDH) are often used as indicators of the rates of aerobic metabolism. The activity of the enzyme lactate dehydrogenase (LDH) is often used as an indicator of anaerobic metabolism. Activities of these key enzymes were examined for spring peepers and American toads during breeding season. For our study two groups of 10 *P. crucifer* and 10 *B. americanus* were captured, weighed, and trunk muscle tissues were extracted. Spectrophotometric enzyme assays were used to determine enzyme activities. Enzyme activities for CS, MDH, IDH were significantly different between *P. crucifer* and *B. americanus*; *P. crucifer* exhibiting the highest levels of all enzymes. Enzyme activities for CS were also significantly different within samples of *P. crucifer*. No significant differences were observed for LDH. These data suggest that *P. crucifer* have higher aerobic metabolic capacities than *B. americanus*.

195. MAKOWSKY, ROBERT AND LAWRENCE A. WILSON. Emory University, Atlanta, GA 30322 and Fernbank Science Center, Atlanta, GA 30307-Diet of *Cryptobranchus alleganiensis* in the Southern Appalachians.

The diet of *Cryptobranchus alleganiensis* was examined in 2000 as part of a long-term study on one of the densest populations of Hellbenders known. The study site is located about 10 miles Northwest of Suches, GA, at the Cooper's Creek recreation area. Composition of stomach contents was flushed from each animal using piped stomach irrigation. The items retrieved were then categorized and tallied based on percent volume and number present. Crawfish encompassed the majority of the diet (by volume) with other arthropods complimenting to a small degree. Hellbender eggs comprised a significant portion of the diet when available in late fall/early winter. Most animals flushed during the winter had empty stomachs indicating a lower metabolic rate and greatly reduced activity.

196. FELIX, ZACHARY I., AND T. K. PAULEY. Marshall University, Huntington, WV 25755-Seasonal, ontogenetic, and diel variation in microhabitat use in three *Desmognathus* salamanders.

We compared the microhabitat use of *Desmognathus welteri*, *D. monticola*, and *D. fuscus* in relation to time of day, season and life stage in three West Virginia streams. An individual's position relative to the water-land interface was used as a measure of microhabitat use. In each analysis pairwise comparisons showed *D. welteri* to be more aquatic than both congeners. No such difference was detected between *D. monticola* and *D. fuscus*. Juvenile *D. welteri* proved to be more aquatic in nature than adults of the same species. No difference was detected in either *D. monticola* or *D. fuscus* with respect to adult and juvenile microhabitat use. *D. monticola* showed seasonal shifts in microhabitat use. Both adult and juvenile *D. monticola* showed a trend toward terrestriality from spring to fall. Nocturnal foraging position and daytime retreat position were similar for each species. The results of our study indicate this community



fits the classic description of an Appalachian *Desmognathus* assemblage with *D. welteri* filling the large-bodied, aquatic niche.

197. SWART, CHARLES C. Department of Biology, University of Louisiana at Lafayette, Lafayette, Louisiana 70504. Tadpoles versus predaceous water bugs, background matching leads to predator advantage.

I tested the interaction of chemical signaling, cover use, and background choice on hunting behavior of *Belostoma lutarium* and antipredatory behavior of *Bufo woodhousei* tadpoles. Initially, both species were tested for preferences for cover and background color. The initial color and background choices were compared to the results of separate trials in which chemical signals of the complimentary species was introduced. I found that *Bufo woodhousei* tadpoles prefer to associate with black backgrounds in the absence of *Belostoma* chemical signals, but switch to using white backgrounds when chemical signals are present. A predation trial showed that *Belostoma* kill more tadpoles on a black background than on white backgrounds. These results are discussed in relation to distribution of these animals in their natural habitat.

198. PELLOS, REY A., CLINTON E. MILLER, AND MICHAEL K. MOORE. Department of Biology, Mercer University, Macon, GA 31207—Habitat associations of larval anurans and their predators along an environmental gradient.

For anurans with free-living aquatic larvae, the complex interactive effects between competition, predation, and the physico-chemical parameters of the aquatic environment are the most important factors affecting the survival and fitness of individual larvae. We examined patterns of habitat use by anuran larvae via quadrat sampling in a southern Piedmont lake. Abiotic conditions ( $O_2$ , temperature, water depth), vegetation, predator type, and predator abundance all varied significantly across transects conducted perpendicular to the shoreline. Larvae of two species of anuran (*Acris crepitans* and *Rana clamitans*) showed significant aggregations of individuals and patterns of habitat partitioning along the gradient. In general, *Acris* larvae were limited to shallower, warmer habitats with lower oxygen content and fewer predators. The results from this study support previous laboratory results showing distinct behavioral and physiological abilities of these species to 'cope' with stressful environments.

199. HANNA, AFIF A. AND JAMES E. JOY. Dept. of Biological Sciences, Marshall University, Huntington, WV 25755—Oswaldocruzia pipiens (Nematoda) infections in the American toad, Bufo a. americana from southwestern West Virginia.

A total of 176 *Bufo a. americana* (51 females, 125 males) was sampled for the presence of *Oswaldocruzia pipiens* at two southwestern West Virginia wetlands locations: Beech Fork lake and Green Bottom Wildlife Management Area. Overall prevalence of infection was 43.2%. Female hosts exhibited a higher prevalence than males, (51.0% verses 40.0%), but the difference was not statistically significant ( $X^2 = 1.78$ ; 1 df;  $P < 0.05$ ). Mean intensity levels were 3.64 and 1.88 for female and male toads, respectively, at Beech Fork, and 2.20 and 1.86 at Green Bottom. Mean intensity of infection in female hosts at the Beech Fork site was significantly greater than in males ( $t = 4.07$ ; df = 45). Conversely, there was no significant difference in mean intensity by host sex at the Green Bottom marsh ( $t = 0.52$ ; df = 27). Numbers of *O. pipiens* females and males did not deviate significantly from a 1:1 ratio.

200. LEONARD, NORMAN E. University of New Orleans, New Orleans, LA 70148. – Response of a tailed frog (*Ascaphus truei*) population to upstream logging.

During the summer of 1998, populations of *Ascaphus truei* in two streams in Oregon were individually marked with toe clips and monitored during a five-week mark-recapture experiment. The study was conducted after logging activities in the headwaters of one stream, and differences were observed between the streams in population structure and magnitude of individual movements. Only 46% of the individuals in the disturbed stream were female compared to 63% female in the undisturbed stream. In the disturbed site, only 2 of 11 marked frogs were recaptured, and these individuals moved less than 4 meters from their original point of capture. In the undisturbed site 17 of 41 marked frogs were recaptured, and were found an average of 4.0 meters ( $\pm 0.9$ ) from their original point of capture. These data are consistent with anecdotal reports of a decrease in population size in the disturbed watershed. Small population size, skewed sex ratios, and limited movements may limit the rate of recovery of tailed frog populations in disturbed streams.

201. Strange, Rex Meade. Department of Biology, Southeast Missouri State University, Cape Girardeau, MO 63701. – Variation in fin ornamentation among egg-mimic darters (*Catnotus*: *Etheostoma squamiceps* species complex).

I examined the relative sizes of fin knobs reputed to be egg-mimics in four species of the *Etheostoma squamiceps* species complex. Theory predicts that males benefit from displaying deceptive signals (egg-mimics) only when an honest signal (body size or a territory of high quality) is unattainable or too costly. Female preference for male size and fin knobs have been demonstrated in some members of the complex, albeit in different species. Conflict between honest and deceptive male strategies should result in two mutually-exclusive states: either large males with weakly developed egg-mimics should predominate in a population, or small males with relatively large (and visible) egg-mimics. Intraspecific variation among *E. oophylax* males show an inverse relationship between male size and relative knob size throughout the breeding season. A similar pattern exists in *E. neopterum* and *E. pseudovulatum*. No relationship exists between knob size and male size in *E. chienense*. Interspecific and inter population comparisons reveal an inverse relationship between average breeding male size and relative knob size. Phenotypes among the egg-mimic darters may be a function of phenotypic constraints imposed by negative allometry and maintained by female mate choice.

202. SCHULTZ, DAVID L., MATTHEW POIRIER, AND ALAINA OWENS. Nicholls State University – Latitudinal variation in the life history of the western mosquitofish (*Gambusia affinis*).

The western mosquitofish, *Gambusia affinis*, occurs over a wide range of latitude, from the Gulf Coast to central Illinois. Populations at different latitudes are likely to have different selection pressures on life history parameters. In the north, shorter growing seasons, cooler water temperatures, and harsher winters are likely to select for life history parameters that promote survival under harsher conditions, such as greater parental investment, reduced reproductive effort, and greater investment in maintenance and storage. To test these expectations we compared life history differences among populations of mosquitofish from different latitudes in a common garden study. The populations compared were from Reelfoot Lake in northwestern Tennessee and Lake Verret in southeastern Louisiana. These populations were chosen because of the physical similarities of the two lakes. Our results largely confirmed our expectations. Although there was an allometric relationship between parental investment and mother's mass, at any given size females from Reelfoot Lake tended to produce larger offspring than those from Lake Verret. Reelfoot Lake females also produced fewer offspring, and stored greater amounts of lipid.

203. DARDEN, TANYA<sup>1</sup>, KENNETH STUCK<sup>2</sup>, WALTER GRATER<sup>2</sup> AND BRIAN KREISER<sup>1</sup>. <sup>1</sup>Department of Biological Sciences, University of Southern Mississippi, Hattiesburg, MS 39406 and <sup>2</sup>Gulf Coast Research Lab, University of Southern Mississippi, Ocean Springs, MS 39564-Evolutionary processes in dystrophic blackwater habitats: speciation and historic biogeography in Enneacanthini sunfishes.

Due to high rates of wetland habitat destruction and subsequent re-creation efforts, it seems crucial to understand the processes involved in the biological interactions of these systems. Current functional knowledge revolves primarily around wetland hydrology and physical vegetative structure, without regard to the rest of the biological community. To aid in filling this gap, my project investigates the evolutionary processes occurring within a tribe of sunfishes that primarily utilizes dystrophic blackwater habitats. Enneacanthini sunfishes range from New Hampshire south to Mississippi within the Atlantic coastal plain. Whereas the regional distributions of all three species overlap, local distributions are quite distinct, often with population isolation. These sunfishes are a model study group to evaluate population structuring due to their distinctive habitat use and distribution patterns. Specifically, this project will reconstruct the evolutionary histories among populations in order to develop a model for dispersal and speciation in wetland habitats. Preliminary sequence data suggest that the mitochondrial control region is informative to evaluate both intra- and interspecific patterns throughout their distributions. An increased mechanistic understanding of these processes will allow for improved management and conservation of the biological communities within these critical resources.

204. WILSON, JUSTIN S., JEREMY C. MARTIN AND GEORGE R. CLINE, Biology Dept., Jacksonville State University, Jacksonville, AL, 36265-1602-Preliminary analysis of the diet of the inshore lizardfish (*Synodus foetens*) from the Mobile Bay area.

The inshore lizardfish (*Synodus foetens*) is a common, bottom dwelling predator living in shallow waters from Massachusetts to the northern Gulf of Mexico. Often caught in shrimp nets over soft and sandy bottoms, this species is referred to as a 'voracious predator' in a popular field guide, but we can find no published data supporting this claim. We collected lizardfish from trawl nets from 4 sites collected over 2 years. Depth of the trawls ranged from 11 – 30 ft from sites in and around Mobile Bay. We dissected stomachs of 83 lizardfish. Nineteen of these individuals (23%) contained food items. Anchovies (*Anchoa*) comprised the bulk of the diet by number, and by estimated volume. Hogchokers (*Trinectes maculatus*) were the next most important food item by number and volume. Sea robins (Triglidae), gobies (Gobiidae) and shrimp (possibly baits from a hook) were incidental items in the diet. Size relations of predator and prey are discussed.

205. EWING, JOHN A., III<sup>1</sup>, STEPHEN T. ROSS<sup>1</sup>, STEPHEN WEEKS<sup>2</sup>. <sup>1</sup>Dept. of Biological Sciences, University of Southern Mississippi, Hattiesburg, MS 39401 and <sup>2</sup>Dept. of Biology, University of Akron, Akron, OH 44325 – Morphological characteristics of unisexual and bisexual silversides (*Menidia*) collected from brackish water pools on Horn Island, Mississippi.

We determined morphological differences among co-occurring unisexual (*Menidia clarkhubbsi*) and bisexual silversides (*Menidia beryllina*, *M. pe-ninsulae*, and *M. beryllina* x *peninsulae*) collected from brackish water pools on Horn Island, MS. Overall, 243 *Menidia* specimens were collected and positively identified (121 *M. beryllina*, 61 *M. peninsulae*, 22 hybrids, and 39 *M. clarkhubbsi*) through cellulose acetate gel electrophoresis using adenylate kinase and phosphoglucosyltransferase-B enzymes. Morphological characterization of these specimens included interspecific comparisons of nine relative morphometric proportions, two meristic counts, and a qualitative rank variable. A discriminant function (DF) analysis indicated significant morphological separation among *M. beryllina*, *M. peninsulae*, and a *M.*

*clarkhubbsi*/bisexual hybrid group. The first two discriminant functions (DF I and DF II) accounted for 97.2% of the overall variance in morphology. About 89.5% of the analyzed cases were classified correctly. Multiple between-taxa comparisons (ANOVA, Games-Howell Post-hoc Test) of highly variant morphological characters indicated a number of significant morphological differences among *Menidia*. Altogether, the greatest interspecific morphological separation occurred when using swimbladder opacity, swimbladder extension length, pre-pectoral length, mouth length, and the second dorsal fin ray count in combination.

206. REINERT, THOMAS R. AND KIMBERLY A. WINTER. D.B. Warnell School of Forest Resources, University of Georgia, Athens, GA, 30602-2152. -Age structure and management of pacú (*Colossoma macropomum*) in the northeastern Bolivian Amazon.

The pacú (tambaqui, Br.) *Colossoma macropomum* is an important commercial and subsistence fish resource in Amazonia. Otoliths of 128 pacú were collected from subsistence harvests from March to December 1999, in the town of Bella Vista, located in northeastern Bolivia. The area is a proposed indigenous territory. Because of minimum size-length (45 cm) and gear restrictions, fish generally do not recruit to the fishery until approximately 11 years of age. The age-structure of the exploited pacú population appears to demonstrate a normal mortality curve for a healthy, minimally harvested fish population. The age-structure and the presence of fish up to 60 years of age indicates a sustainable harvest age structure and healthy flooded-forest habitat for the pacú. However, the flooded-forest ecosystem upon which the pacú depends is currently threatened by encroaching cattle production, development activities, and land tenure conflicts in the Itonama Indigenous Territory.

207. BILLINGTON, NEIL<sup>1</sup>, AND MICHAEL J. MACEINA<sup>2</sup>. <sup>1</sup>Dept. Biological Sciences, Troy State University, Troy, AL 36082 and <sup>2</sup>Dept. Fisheries and Allied Aquacultures, Auburn University, Auburn, AL 36849. Conservation options for the rare and genetically distinct southern walleye in the Mobile drainage basin.

Walleye (*Stizostedion vitreum*) from the Mobile drainage are rare, but genetically distinct from northern walleye populations. The objective of this research was to document threats to the conservation of the Mobile drainage (southern) walleye. These threats include habitat degradation, thermal challenges to spawning, and hybridization/introgression with stocked or invading northern walleye. Genetic variation in the southern walleye was examined by allozyme and mtDNA analyses, particularly in relation to threats related to the stocking of northern walleyes into the Mobile drainage. All of the Mobile drainage walleyes had the unique southern walleye mtDNA haplotype, indicating that stocked northern female walleye had not survived and reproduced. Three fish in the western part of the Mobile drainage had alleles more typical of northern walleye. These alleles could have been contributed by stocked male northern walleyes that had bred with southern walleye females, or by northern males invading the Mobile drainage via the Tennessee-Tombigbee Waterway (TTW) and breeding with southern females. Conservation options include habitat protection, reducing angling, not stocking northern walleye, preventing the immigration of northern walleye through the TTW, and supplemental stocking of genetically pure southern walleye.

208. DOOSEY, MICHAEL H. Dept. Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN 37996- Historical and Current Distribution of Fishes of the Little Pigeon River (French Broad/Tennessee R. drainage)

An ichthyofauna survey of the Little Pigeon River, Sevier County, Tennessee, is being conducted. Historical records dating back to 1937 report 82 species from the system. These collections have been summarized and will be compared to the present distribution of fishes based upon additional collections that will be completed in the fall of 2001. Currently 76 species are known from the system. *Ichthyomyzon castaneus*, *Dorosoma petenense*, *Moxostoma*

*breviceps*, *M. carinatum*, *Pylodictis olivaris*, *Morone chrysops*, and *Lepomis gulosus* are new Little Pigeon drainage records. *Erimystax insignis*, *Macrhybopsis storeriana*, *Noturus* sp. cf. *elegans*, *N. eleutherus*, *Lepomis megalotis*, *Etheostoma camurum*, *Percina macrocephala* and *P. sciera* may be extirpated.

209. RADZIO, THOMAS. A.<sup>1</sup>, HERBERT M. AUSTIN<sup>2</sup>, DONALD M. SEAVER<sup>2</sup>, AND TIMOTHY W. STEWART<sup>1</sup>. <sup>1</sup>Dept. Natural Science, Longwood College, Farmville, VA 23909 and <sup>2</sup>Fisheries Dept., Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, VA 23062-1346. -Summer feeding habits of juvenile striped bass, *Morone saxatilis*, in the James River, Virginia.

This study examines the summer feeding habits of juvenile striped bass, *Morone saxatilis*, an ecologically, recreationally, and commercially important anadromous fish species. Young-of-the-year striped bass (40-110 mm) were collected by seine in late July and early August 2000 from 11 sites, 19 to 126 km above the mouth of the James River. Diet composition reflected prey community composition associated with salinity patterns and included amphipods, annelids, copepods, decapods, eggs, fish, insect larvae, isopods, and unidentified crustaceans. Chironomids and annelids dominated fish diet at freshwater upstream sites. Marine amphipods (*Corophium* sp.) dominated fish diet at saline downstream sites, while chironomids and annelids were absent. The ability of juvenile striped bass to feed on the most abundant available prey is an important evolutionary adaptation for survival in the highly variable estuarine environment. Fish used in this study were collected by the Virginia Institute of Marine Science, Juvenile Striped Bass Beach Seine Survey and additional support was provided by the Longwood College Fund for Student Research, Internships, and Public History.

210. ROSS, STEPHEN T.<sup>1</sup>, RYAN J. HEISE<sup>1</sup>, WILLIAM T. SLACK<sup>2</sup>, JOHN A EWING, III,<sup>1</sup> MARK DUGO<sup>1</sup>, AND MOLLIE F. CASHNER<sup>1</sup>. <sup>1</sup>Dept. Biological Sciences, University of Southern Mississippi, Hattiesburg, MS 39406-5018 and <sup>2</sup>Mississippi Department of Wildlife, Fisheries and Parks, Mississippi Museum of Natural Science, Research and Collections Program, 2148 Riverside Drive, Jackson, MS 39202-1353. -Timing of Seaward Movement and Coastal Habitat Use of Gulf Sturgeon from the Pascagoula River, Mississippi

The Gulf sturgeon, *Acipenser o. desotoi*, is an anadromous species that historically occurred in Gulf of Mexico drainages from Tampa Bay to the Mississippi River. Most studies of this subspecies have focused on the freshwater phase of its life history. Thus, little is known concerning patterns of movement and habitat use in salt water. Since 1999 we have used sonic telemetry to study coastal habitat use of Gulf sturgeon. In 1999 we attached sonic transmitters to 14 Gulf sturgeon while they were in fresh water. These fish began leaving the Pascagoula River in October, with 50% gone by mid-November. Greatest seaward movement occurred with a large increase in river discharge in conjunction with a decline in water temperature. To date, we have 15 relocations for nine of these fish. Fish moved extensively; however, once they left the Pascagoula estuary, relocations were primarily near barrier islands bordering Mississippi Sound. Of five fish located outside of the vicinity of the Pascagoula estuary, four were near barrier island passes. The substratum in these locations was primarily coarse sand with shell fragments. In 2000, we tagged 30 Gulf sturgeon; as of early November these fish were just beginning to move into salt water.

211. LOWMAN, BENJAMIN<sup>2</sup>, ERICH EMERY<sup>1</sup> AND DONALD TARTER<sup>2</sup>. <sup>1</sup>Ohio River Valley Water Sanitation Commission (ORSANCO), Cincinnati, OH and <sup>2</sup>Department of Biological Sciences, Marshall University, Huntington, WV 25755-Changes among Ohio River fish populations due to habitat conditions created by water quality improvement and high-lift dams.

Fish populations in the Ohio River have been monitored extensively by the Ohio River Valley Water Sanitation Commission (ORSANCO), along with state and Federal agencies, for over 40 years. The population data, collected via lock chamber rotenone surveys, showed that many species of Ohio River fish have demonstrated marked increases in abundance since these studies began. These trends in population density, both gradual and sharp, are likely associated with water quality improvements and the construction of high-lift dams. Pearson-r correlation through linear regression analyses yielded that nearly 20 species of populations examined exhibit significant density increases from 1957 to 1998. An additional 25+ species of those examined show distinct peaks in abundance by way of polynomial regression analyses. These trends were further revealed when population data was separated into three river sectionsCcollections made from the upper, middle, and lower river. Such gradual increases in density are possibly related to improvements in water quality; these trends closely parallel changes induced by the Clean Water Act, 1972, which strengthened the control of waters discharged into the river. Also, Aspikes@ in fish density mirror increases in resource availability as high-lift dams expanded the water in the river channel.

212. TOMASEK, TERRY M. AND DONALD C. TARTER. Department of Biological Science, Marshall University, Huntington, WV 25755-Site specific impact study on the effects of contour seam mining and valley fill construction to the benthic macroinvertebrate community and water chemistry.

Downstream impacts of contour surface mining and valley fill construction were evaluated utilizing both water chemistry and EPA approved Rapid Bioassessment Protocol III. A first order stream in southern West Virginia was sampled in February of 1999 before mining perturbation. Five downstream stations were established with benthic macroinvertebrates and water collected seasonally over a sampling period of sixteen months. Pre-mining water chemistry data showed low alkalinity, acidity, sulfates, metals (aluminum, iron, manganese), total suspended solids (TSS), total dissolved solids (TDS), specific conductivity, and an average pH of 8.1. During the first twelve months of mining pH values ranged from 6.88 to 8.21. Increases were seen for alkalinity, sulfates, TDS, TSS and specific conductivity. Manganese was the only metal to show sharp fluctuations. Initially, benthic macroinvertebrate communities were well balanced within the stream. There was a high abundance of EPT individuals compared to Chironomidae. Taxa richness ranged from 14 to 29 across the five sampling sites while the dominant families were Chironomidae, Nemouridae, Heptageniidae, and Elmidae. One year later, taxa richness ranged from 21 to 24 but the dominant family across all stations in the main channel of the stream was Chironomidae. The Modified HBI increased from an average of 3.3 to 4.5 while the percent shredders and filterer/collectors decreased.

213. FRANKLIN, SCOTT B.<sup>1</sup>, JOHN A. KUPFER<sup>2</sup>, REZA PEZESHKI<sup>1</sup>, AND NATASJA VAN GESTEL<sup>3</sup>. <sup>1</sup>Dept. of Biology, University of Memphis, Memphis TN 38152, <sup>2</sup>Dept. of Geography and Regional Development, University of Arizona, Tucson, AZ 85721 and <sup>3</sup>Institute of Ecosystem Studies, Millbrook, New York 12545-Channelization effects on floodplain nutrient pools in western Tennessee.

Soil and leaf fall nutrient levels and soil redox potential were used to assess the effects of channelization on the functioning of low-gradient river floodplains in western Tennessee. One function of these floodplains is nutrient cycling, and we tested differences in nutrient levels of leaves and soil on two channelized (C), two channelized and leveed (CL), and two unchannelized rivers (U). Four plots were located on each river: two depressional and two nondepressional sites. Leaves were collected every two weeks from October through December (1998, 1999). Soils samples were collected during the following spring (1999, 2000). Redox potential was determined during June, July and August of 1999. The take home message is that levees essentially create an upland functioning system, while channelization only may be quite similar to unchannelized streams. The CL streams maintained higher redox potential than the C streams throughout the summer months. Leaf nutrient pools were generally highest in CL streams, and lowest in U streams. Soil nutrient pools were generally highest in

depressional sites while leaf nutrient pools were highest in nondepressional sites. Generally, the CL sites had higher nutrient pools than the other sites. The drier CL sites are functioning similar to rain-fed upland systems.

214. LOWRANCE, ANDREA<sup>1</sup>, GARY WEIN<sup>2</sup> AND REBECCA SHARITZ<sup>1,2</sup>.  
<sup>1</sup>Department of Botany, University of Georgia, Athens, GA 30602 and <sup>2</sup>Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29802. – Shoreline wetlands creation: A trajectory for success.

Wetland restoration and creation projects are normally monitored over relatively short time scales in order to evaluate success. The regulatory time frame in which successful wetland establishment must be judged, however, is often much shorter than the ecological time frame in which a diverse and self-sustaining system may become established. In L-Lake, a 400-ha reservoir built in 1985, development of shoreline wetlands was encouraged in a target area of the lake by planting native species and introducing soil containing propagules from a nearby donor wetland. Shrub, herbaceous emergent, floating-leaved, and submersed aquatic species were planted across a depth gradient in experimental blocks, matching plant species to their typical water depth conditions. Within five years, species richness was similar in planted and unplanted blocks at all depths, but percent cover was significantly lower in unplanted blocks in emergent zones. By twelve years, there was convergence between planted and unplanted blocks at all depths. Although establishment of wetland marsh vegetation was not achieved throughout the target area within a typical regulatory time period, the initial planting effort provided a colonization source for the unplanted portions of the lake, both affecting and accelerating successional development of this lacustrine wetland system.

215. YOUNG, JAMES A. J. AND FRANK A. ROMANO, III. Department of Biology, Jacksonville State University, Jacksonville, AL 36265. –A preliminary analysis of a marine meiofauna survey from Dauphin Island, AL.

During the summers of 1999 and 2000 marine meiofauna were sampled from the beaches of Dauphin Island, AL. Samples were taken from beaches at mile intervals beginning at the east end of Dauphin Island. A sample consisted of 500 cc's of sand collected from the littoral zone. Samples were washed alternately with freshwater and saltwater (3 washes each) and then strained through a nested sieve series (250  $\mu$ m – 45  $\mu$ m). Freshwater subjects the meiofauna to osmotic shock that causes them to release their hold on sand grains. Materials collected on the 63  $\mu$ m and 45  $\mu$ m sieves, were preserved in 10% buffered formalin stained with rose bengal, and stored in 70% isopropyl alcohol. Meiofauna were counted and tardigrades extracted from samples using a micropipette. To date 4 samples have been completed. A total of 5070 meiofauna have been counted. Nematodes account for 69.9%, harpacto-copepods account for 12.5%, and tardigrades account for 12.1% of the collection. Miscellaneous organisms make up the remainder of the collections, containing organisms such as foraminiferans, clams, polychaetes, and possibly, kinorhynchans.

216. FAULKNER, BRIAN D.<sup>1</sup>, WILLIAM C. BOWEN<sup>1</sup>, DAN A. CINCOTTA<sup>2</sup>, KIRK G. BARNETT<sup>1</sup> AND DONALD C. TARTER<sup>1</sup>. <sup>1</sup>Department of Biological Sciences, Marshall University, Huntington, WV 25755, <sup>2</sup>West Virginia Department of Natural Resources, Elkins, WV 26241.–A baseline genetic study of the *Clinostomus funduloides* and the *Clinostomus elongatus*, in West Virginia.

The WVDNR regards the status of *Clinostomus elongatus* as undetermined in their conservation documents due to limited distribution information available from state waters. During genetic investigation of two disjunct populations of *C. elongatus*, a genetic variation between two populations of *C. funduloides* was found. The analysis of the 12S region of the mtDNA of the *C. funduloides* showed a substantial variation between the two populations. The purpose of this research was to obtain strands of the cytochrome b region of the mtDNA



for analysis and comparison to percentage differences found in other species. This data will add to the general knowledge of the species and assist future conservation and management decisions regarding *C. funduloides* in West Virginia. The genetic baselines obtained from this research may play a future role in classification ramifications.

217. DARDEN, RICHARD<sup>1</sup>, KENNETH STUCK<sup>2</sup>, WALTER GRATER<sup>2</sup>, PATRICIA BIESIOT<sup>1</sup> AND BRIAN KREISER<sup>1</sup>. <sup>1</sup>Department of Biological Sciences, University of Southern Mississippi, Hattiesburg, MS 39406 and <sup>2</sup>Gulf Coast Research Lab, University of Southern Mississippi, Ocean Springs, MS 39564-  
Molecular Method To Distinguish Larval *Callinectes sapidus* And *C. similis* from Non-Indigenous *C. bocourti* (Crustacea:Decapoda:Portunidae)

Ship ballast water is a major source of introductions of coastal marine species, particularly of holoplankton and meroplankton with relatively long-lived planktonic larvae. Morphological similarity during early life history stages of *Callinectes* spp. makes larval identification difficult. However, nucleotide sequences within the mitochondrial DNA of these species vary sufficiently to serve as reliable species identity markers. A portion of the 16S rRNA gene was amplified via the polymerase chain reaction (PCR) and sequenced to determine the number of variable nucleotide sites. Uniquely variable sites serve as restriction enzyme cleavage sites to produce species-specific DNA restriction fragment length polymorphisms (RFLPs). Following testing of this technique using known species mixtures and sample concentrations, we will test the method using field collected plankton samples. For example, adults of the invasive *Callinectes bocourti* collected in the Back Bay of Biloxi and Mississippi Sound have presumably been transported as larvae via ship ballast water. The species identification technique described here may prove useful in studying the introduction and spread of non-indigenous species via ballast water.

218. SIRNA, CYNTHIA AND SAFAA AL-HAMDANI. Jacksonville State University, Jacksonville, AL, 36265.- Potential role of *Salvinia* in remediation of nitrogen and phosphorous from a eutrophic habitat.

This project was designed to evaluate the potential use of *Salvinia minima* as a biological agent in the recycling of the excess nitrogen and phosphorous from media containing different levels of nutrient combinations. The selected concentration of nitrogen and phosphorous ranged from average expected levels in natural habitats to ten and 100 fold higher. *Salvinia* appeared to respond more favorably to the elevated levels of nitrogen and phosphorous. Phosphorous was secondary in its affect on the population growth in comparison to nitrogen. *Salvinia* appeared nutritionally viable source for animal feed with nearly 40% crude protein and high levels of digestible fiber. *Salvinia* can be considered as an important biological agent in recycling the excess nutrients.

219. MOLAVI, MEHDI, AND JACK W. GRUBAUGH. Dept. of Biology, University of Memphis, Memphis, TN 38152-The influence of river modification on sedimentation and leaf litter decomposition rates in river floodplain systems of the lower Mississippi Alluvial Valley.

Floodplain river systems of the lower Mississippi Alluvial Valley have been extensively modified through channelization and levee construction to facilitate human activities. These impacts potentially impact floodplain ecosystem functions such as leaf litter decomposition. Sediment accumulation and leaf litter decomposition rates were determined in floodplain habitats along six differentially impacted river systems (two "unimpacted," two channelized, and two channelized/leveed). Sediment accumulation rates significantly differed among treatments, with highest accumulation occurring in natural systems and lowest in channelized/leveed systems. Additionally, decomposition rates were significantly and negatively correlated to sediment accumulation rates. These results suggest that river modifications may impact ecosystem

function by altering rates of leaf litter decomposition through reduction of sedimentation in floodplain habitats.

220. DE STEVEN, DIANE<sup>1</sup>, CHRISTOPHER BARTON<sup>1</sup>, JULIAN SINGER<sup>1</sup> AND REBECCA SHARITZ<sup>2</sup>. <sup>1</sup>USDA Forest Service, Center for Forested Wetlands Research, Charleston, SC 29414 and <sup>2</sup>Savannah River Ecology Lab, Aiken SC 29802. – A large-scale experiment for restoration of depression wetlands in South Carolina.

Carolina bays and other depression wetlands are abundant features across the Southeastern landscape, but few have escaped severe disturbance or loss of wetland functions. Hydrologic restoration of artificially drained sites can be achieved by plugging existing ditches. However, restoration of biotic elements may require management interventions. We describe the objectives and design of a large factorial experiment to test strategies for restoring small Carolina bays on the Savannah River Site, South Carolina. Experimental treatments will be implemented in the winter and spring of 2001. In sixteen restoration sites, vegetation development toward two planned wetland goals (herbaceous, forested) will be evaluated as a function of site conditions, seed bank composition, and supplemental planting. Effects of two management options for upland buffer-zones (closed-canopy pine-hardwoods or open-canopy fire-managed pines) on restoration outcomes will be compared. Characterization of pre-restoration soils, hydrology, vegetation, seed banks, and wildlife diversity has been completed. Component studies will monitor post-restoration responses for each element. A model using depression topography and hydric soils data predicts restored wetland boundaries. Although the seed banks contain wetland species, supplemental planting is expected to accelerate vegetation development. Restoration success will be assessed after five years of annual monitoring.

221. FIKES, L.<sup>1</sup>, J. PORTERFIELD<sup>2</sup>, AND C. HELPS<sup>3</sup>. <sup>1</sup>Hendrix College, Conway AR 72032, <sup>2</sup>Centre College, Danville, KY 40422, and <sup>3</sup>Biology Dept., Furman University, Greenville, SC 29613-Microhabitat use by stream fish and anthropogenic effects in the Enoree River basin, SC.

The current study examined the microhabitat selection of minnows, darters, catfish, and sunfish in the Enoree River basin in and around Greenville, SC. At each site, subreaches were designated as pools, runs, or riffles, blocked off downstream with a 4'x10'x1/8" seine, and sampled for fish with a backpack electrofisher. Characteristics of each subreach were recorded (including depth, area, substrate type, vegetation, woody debris), and fish were either identified and released, or preserved for identification confirmation and vouchering. A Principal Components Analysis (PCA) was performed to see which variables were correlated with the presence of each family in a given subreach. In the PCA, presence of darters in a subreach was correlated with shallower depths and gravel/cobble substrates, presence of catfish was correlated with woody debris, and minnows occupied all microhabitats. These results indicate that different fish families do exhibit different microhabitat preferences, and it is likely that such microhabitat heterogeneity must be present in a given stream for many fish species to be found there. In developing areas, such as Greenville, anthropogenic use of watersheds affects stream microhabitats. This study suggests that such microhabitat loss greatly affects the fish biodiversity in an impacted stream.

222. HAMILTON, ROBERT IV, PETER S. KOURTEV, AND JOAN G. EHRENFELD. Dept. of Ecology, Evolution, and Natural Resources, Rutgers University, New Brunswick, NJ 08901-Effects of water quality and habitat modification on benthic macroinvertebrates in urban forested wetlands in northeastern New Jersey.

Watersheds in urban landscapes have been subjected to a variety of stressors. Numerous water quality assessments have been conducted to determine the extent and severity of these stressors. However, most assessments focused on only one aspect of disturbance and little data exists about the relationship between the disturbance event and ecological integrity within the site. This study was conducted to determine the effects of water quality and habitat modification on benthic macroinvertebrate community assemblages in urban forested wetlands. We sampled water channels at nine sites in north central New Jersey using a modified EPA rapid bioassessment protocol. Data were collected for 25 habitat parameters and 15 water quality parameters. We also collected benthic macroinvertebrates using a D-frame dip net, then subsampled and identified them in the lab. Based on our findings it appears that habitat heterogeneity within the channels and organic matter input from the surrounding forests may lessen the effects of poor water quality and habitat modification.

223. BONE-STRICKLAND, SAMANTHA<sup>1&2</sup>, TERRY RICHARDSON<sup>2</sup> AND FRANK ROMANO<sup>1</sup>. <sup>1</sup>Jacksonville State University, Jacksonville, AL 36265 and <sup>2</sup>University of North Alabama, Florence, AL 35630 -Energy budgets of aestivating and non-aestivating populations of a freshwater prosobranch snail.

*Viviparus georgianus* is a common freshwater snail typically inhabiting permanent streams and lakes throughout the eastern United States. Two populations, one inhabiting a permanent stream and one inhabiting a temporary wetland, have been found in north central Alabama. The seasonal wetland is typically dry from mid May to late September; prosobranchs have not been previously known to inhabit such seasonal habitats in the United States. It appears that the population at the seasonal wetland enters aestivation when the wetland dries. Respiration studies during the aestivation state show the seasonal wetland snails have a lower respiration rate than snails from the permanent habitat. Respiration studies also show that there is no difference between the two populations' oxygen consumption while submerged. A negative scope for growth was seen during the aestivation state due to the snails not emerging to feed. The lowered respiration rate and the negative scope for growth suggest the population at the temporary site may be adapted for conservation of energy during aestivation.

224. HUDGENS, HILLARY A., SCOTT L. STEWART, AND LAWRENCE W. ZETTLER. Department of Biology, The Illinois College, Jacksonville, IL 62650 -Symbiotic germination of the rein orchids (*Habenaria repens*, *H. quinquiseta*, *H. macroceratitis*) and a description of orchid mycorrhizal fungi from Florida.

The destruction of wetlands in populated states (e.g., Florida) has generated interest in habitat restoration. Terrestrial orchids, a common biotic component of wetlands, require specific mycorrhizal fungi to initiate seed germination and seedling development in nature. Thus, for orchids to be successfully established in restored habitats, the mycorrhizal symbiont(s) must also be present to spawn seedlings. Conceivably, orchids cultivated from seed *in vitro* with fungi (=symbiotic seed germination) could be introduced into restored habitats with fungus-infected seedlings serving as a source of inoculum. We describe: (1) a symbiotic technique to germinate seeds of three wetland rein orchid species native to Florida (*Habenaria repens*, *H. quinquiseta*, *H. macroceratitis*); (2) a means to cultivate *H. repens* seedlings on soil *ex vitro*; and (3) the orchid mycorrhizal fungi that initiate germination and development. Seeds of all three *Habenaria* spp. germinated within 21 days of inoculation. Leaf-bearing seedlings of *H. repens* were obtained using two fungal isolates (*Epulorhiza* spp.) recovered from Florida orchids *Spiranthes brevilabris* and *Epidendrum conopseum*. Seedlings infected with the *S. brevilabris* fungus that were transferred to peat in a greenhouse had the lowest (11.1%) mortality (>159 days *ex vitro*). The rapid development of *H. repens* suggests that this terrestrial orchid may exist as an annual in nature under favorable conditions.

225. MINSO, JAGILA<sup>1</sup>, SCOTT L. STEWART<sup>1</sup>, LAWRENCE W. ZETTLER<sup>1</sup>, AND PAUL MARTIN BROWN<sup>2</sup>. <sup>1</sup>Department of Biology, The Illinois College, Jacksonville, IL 62650, <sup>2</sup>Florida Museum of Natural History, University of Florida Herbarium, Gainesville, FL 32611 - Seed propagation and reintroduction of an endangered orchid (*Spiranthes brevilabris* Lindley) from Florida.

Once widely distributed along the Coastal Plain from Texas to South Carolina, the short-lipped ladies'-tresses, *Spiranthes brevilabris* Lindley (Orchidaceae), appears to be restricted to a single population in Levy Co., Florida consisting of 152 plants (adults and seedlings) in 1999. Recent efforts to locate additional populations throughout its range have failed. We describe: (1) a technique to germinate seeds of this endangered orchid *in vitro* using mycorrhizal fungi (=symbiotic seed germination); (2) a technique to establish/reintroduce seedlings onto soil *ex vitro*; and (3) a naturally-occurring mycorrhizal fungus of *S. brevilabris* from the Levy Co., FL site. Seeds of *S. brevilabris* were inoculated with mycorrhizal fungi (*Epulorhiza* spp.) recovered from two orchid species: *Epidendrum conopseum* (= *E. magnoliae*) and *S. brevilabris*. Seed germination was rapid (<10 days), and more seeds germinated using the *E. conopseum*-derived fungus (49.8% to 42.6%). Few (1.7%) seeds germinated in the absence of a fungus (=control). More seedlings developed leaves *in vitro* when inoculated with the *S. brevilabris*-derived fungus (26.1% to 20.4%) following light exposure. Of 165+ laboratory-grown seedlings transplanted onto soil at 6 sites in Florida, all (100%) have survived >1 month. Efforts are continuing to monitor seedling survival and development leading to flowering and seed set.

226. AL-HAMDANI, SAFAA, SHANNA MATTINGLY, AND KIRBY SWENSON. Jacksonville State University, Jacksonville, AL, 36265. Remote sensing as a tool for plant stress identification.

This project was designed to evaluate the potential use of aerial remote sensing data to identify stress areas in agricultural fields. The project was carried out for two years evaluating cotton (*Gossypium hirsutum*) and corn (*Zea mays*) crops in different fields within northeast Alabama. The aerial photography data was analyzed and compared with similar data obtained on the ground level. In addition, the physiological status of plants within each field was evaluated. The aerial remote sensing data coincided with the ground level measurements indicating the potential benefit of the aerial photography in identifying problems within the agricultural fields. Light reflectance in the near infrared and infrared bands appears to be the most beneficial in identifying the stress areas of the agriculture field.

227. BURDETTE, SARAH BETH<sup>1</sup>, JEFFREY D. MAY<sup>1</sup>, FRANK S. GILLIAM<sup>1</sup>, AND MARY BETH ADAMS<sup>2</sup>. <sup>1</sup>Dept. Biological Sciences, Marshall University, Huntington, WV 25701 and <sup>2</sup>USDA Forest Service, Parsons, WV 26287, USA - Interspecific responses of foliar nutrient concentrations to excessive nitrogen deposition.

Although effects of excessive nitrogen (N) deposition on eastern forest soils have been extensively studied, plant nutrient responses have not been as actively researched. We studied foliar nutrient dynamics in trees on two watersheds supporting stands of similar age at the Fernow Experimental Forest in West Virginia: WS3 (fertilized with ammonium sulfate annually since 1989) and WS7 (untreated control). Foliar nutrient concentrations were determined for *Liriodendron tulipifera*, *Prunus serotina*, and *Acer rubrum* on each watershed. Data from 1992 demonstrated significantly elevated foliar N in all three species on WS3; but, by 1999, several interspecific response differences emerged. Foliar N in *A. rubrum* on WS3 declined 40% since 1992, yet remained statistically unchanged in the control watershed. Foliar N also declined significantly in *P. serotina* during this time; however, *L. tulipifera* showed no significant response to treatment. Foliar calcium levels increased significantly on WS3 in *L. tulipifera* since 1992, while in *A. rubrum*, the levels significantly declined on WS7. Such substantial interspecific divergence in nutrient responses to excessive nitrogen deposition may lead to changes in relative tree vigor and ultimately to shifts in species composition. This work is supported by a seed grant from the USDA NRI-CGP.

228. COLE, PATRICE G.,<sup>1</sup> WELTZIN, JAKE F.,<sup>1</sup> and MICHAEL A. HUSTON.<sup>2</sup> <sup>1</sup>Dept. of Ecology and Evolutionary Biology, The University of Tennessee, Knoxville, TN 37996 and <sup>2</sup>Oak Ridge National Laboratory, Oak Ridge, TN 37831 – Identifying the habitat characteristics of the non-native, invasive grass, *Microstegium vimineum*.

*Microstegium vimineum* (Japanese grass) is an invasive, annual C<sub>4</sub> grass of increasing concern to land managers in the southeastern United States. For example, in the Great Smoky Mountains National Park, *M. vimineum* is ranked highest in significance of impact and lowest in feasibility of control among the 35 non-native plant species identified as serious threats to that biosphere reserve. During summer and fall 2000, we mapped the distribution of *M. vimineum* on the Oak Ridge National Environmental Research Park, Tennessee, using GPS technology and GIS software. We also collected data on soil characteristics, topography, leaf litter, canopy cover, light levels, disturbance history, and plant community type, to determine how these site characteristics were associated with height, density, and biomass of *M. vimineum*. Preliminary data suggest a positive correlation between *M. vimineum* biomass and volumetric water content ( $r = 0.40$ ,  $p = 0.1$ ), a negative correlation between *M. vimineum* biomass and biomass of other plants ( $r = -0.39$ ,  $p = 0.1$ ), and a negative correlation between *M. vimineum* biomass and litter mass ( $r = -0.38$ ,  $p = 0.1$ ). The survey results will help identify environmental factors that determine the distribution and abundance of this invasive plant.

229. PHILLIPS, ROSS J.<sup>1</sup>, THOMAS R. WENTWORTH<sup>2</sup>, HEATHER M. CHESHIRE<sup>3</sup>, JOHN FELS, LAURA BUNYAN, MICHAEL SCHAFALÉ<sup>4</sup>, AND JOHN AMOROSO<sup>4</sup>. <sup>1</sup>USDA Forest Service, Southern Research Station, Clemson, SC 29634, <sup>2</sup>Department of Botany, North Carolina State University, Raleigh, NC 27695, <sup>3</sup>Center for Earth Observation, North Carolina State University, NC 27695, <sup>4</sup>North Carolina Department of Environment and Natural Resources, Raleigh, NC 28699—Classification and predictive modeling of plant communities in the Gorges State Park and Gamelands, North Carolina.

A method of rapid field assessment and predictive modeling was developed to characterize vegetation communities of the Gorges State Park and Gamelands and to create predictive community maps for the area. This method placed an emphasis on locating rare communities using expert information, existing databases, aerial photography, and random encounters in efforts to provide information to researchers and park personnel about community locations. Approaches for classifying these communities were examined to identify which would provide suitable units for modeling community types. We sampled 102 field locations and assigned their vegetation to 16 different community types. Predictive community maps were generated using discriminant functions incorporating digital terrain data, including elevation, slope, relative slope position, terrain shape index, and landform index. Three sets of discriminant functions were created to meet the different needs of persons interested in using these maps. Photo-interpreted cover classes were also including in the modeling process as filters. Map accuracies ranged from 65% to 75%, with those using only discriminant functions (without filtering) yielding higher accuracies.

230. LYNCH, KATHLEEN M., JAMES S. FRALISH, AND JAMES J. ZACZEK. Southern Illinois University, Carbondale, Illinois 62901—Study of forest community change at Land Between The Lakes, Kentucky and Tennessee.

Forest succession is a central ecological concept that is best studied through long-term analysis. From 1987 to 1989, relocatable sampling units were established in 137 forest stands at Land Between The Lakes, KY and TN. Stratum analysis indicated that 73 stands were either rapidly or potentially successional. The goal of this study was to evaluate the progression and pattern of forest change through a resampling of these stands. Tree species, diameter, and sapling and seedling count data were collected on standardized circular and nested circular plots. Analyses indicate that *Acer saccharum* continues to grow into the overstory stratum.

Losses of *Fraxinus*, *Carya*, *Quercus alba*, and *Sassafras albidum* were observed in the midsize class, probably due to increasing shade intolerance under a relatively closed canopy. Decreases in basal area were also noted as dominant individuals in the red oak group experienced mortality. These combinations indicate that *Acer saccharum* is expected to become a major component of many LBL forest communities.

231. KETTLER, KATIE E., STEPHANIE ROBERTS, KENNETH WILSON AND DAVID FRANCKO. Dept. of Botany, Miami University, Oxford, OH 45056 – Selection for Cold Tolerance Levels in *Sabal palmetto* (Cabbage palm), and *Sabal minor* var. 'Louisiana' (Bluestem palmetto).

*Sabal minor* var. 'Louisiana' is more cold tolerant than *Sabal palmetto*, and is native to the southeast. *Sabal palmetto* is common to the coastal south and has been reported to survive temperatures of zero degrees F. Both palms are currently under cultivation at Miami University in southwest Ohio, in microclimates varying from USDA zone 6a to 7a/b. Seeds were surface disinfected, and then embryos were extracted and placed on a variety of media. We are screening temperature sensitivity in tissue cultures of the two palms, with a goal of altering their thermotolerant thresholds. Tissue cultures are be subjected to sub freezing temperatures and the damage will be assessed, by measuring the conductivity of the ions that leak out. Finally the tissue cultures will be completely frozen, and the total ion leakage out of the embryo is estimated. From loss-balance calculations it is possible to graph ion leakage as a function of temperature and determine control temperature thresholds for each palm species. This data will be used to identify especially cold-tolerant phenotypes. Once we find these individuals we will introduce them to the climate of Ohio.

232. CLAUDIA L. JOLLS<sup>1,2</sup>, ARIELLE COOLEY<sup>2,3</sup> AND JON D. SELLARS<sup>1</sup>.  
<sup>1</sup>Department of Biology, East Carolina University, Greenville, NC 27858,  
<sup>2</sup>University of Michigan Biological Station, Pellston, MI 49769 and <sup>3</sup>Pomona College, Claremont, CA—Germination ecology of seabeach amaranth, *Amaranthus pumilus*, in controlled environments.

Persistence of the federally threatened annual, *Amaranthus pumilus* Raf., requires successful seed germination and seedling establishment. We first compared field vs. lab stratification (chilling) on germination. Dormant seeds (50 ea.) were placed at 0, 15 cm and 30 cm burial at three sites at Cape Hatteras National Seashore, NC, refrigerated at 5 °C, between February and April 2000. Germination for field-stratified seed was significantly higher than that of the laboratory: 79.3% (n=450) vs. 59.8% (n=400). More seeds germinated when stratified at 30 cm (86.0%) than shallower depths (74.0% or 78%). We also investigated the effects of seed burial depth, substrate type and the presence/absence of soil microbes on nondormant seed in the growth chamber. A minimum of 35 seeds was used in each treatment: 0, 2, 4 and 6 cm burial, sand vs. shell substrate, sterilized vs. unsterilized sand. Burial suppressed germination and emergence, including a 6 d delay of emergence from 6 cm depth relative to 0 and 2 cm. No effects of substrate type nor presence/absence of microbes were observed. Our results suggest that for both dormant and non-dormant seeds, microsite (burial, water availability and alternating temperatures) is a major factor for the success of seabeach amaranth.

233. MOORE, PATRICK T. AND JAMES J. ZACZEK. Southern Illinois University, Carbondale, IL 62901-4411—Silvicultural guidelines for the reintroduction of American chestnut in the central hardwood region.

The American Chestnut Foundation is expected to have developed a blight-resistant American chestnut (*Castanea dentata*) seed by the year 2006. By this time, we must have a set of silvicultural methods for the reintroduction of this species into its original range. Ten different planting methods were tested to determine which practices had the greatest positive effect on height, stem caliper, and survival after two growing seasons. These methods included the use

of tree shelters, herbicide, and two stock types. The growth characteristics of American chestnut were compared to those of Chinese chestnut in order to determine whether the abundance of information presently available for Chinese chestnut is applicable to American chestnut. In general, the more intensive strategies produced the greatest amount of planting success. Tree shelters dramatically increased survival and height but not necessarily stem caliper. Weed control slightly increased survival rates and had some effect on height and stem caliper. The containerized stock type outperformed the direct-seeded stock. Chinese chestnut responded differently than American Chestnut under the same silvicultural conditions.

234. VAUGHN, KAREN H., EDUARDO AQUILAR ESPINOZA, SOFIA ARCE FLORES, CHRISTOPHER L. CLARY, AND MARTIN L. CIPOLLINI. Department of Biology, Berry College, Mount Berry, GA 30149—Status of Longleaf Pine (*Pinus palustris*) on the Berry College campus, and implications for long-term management.

Longleaf Pine (*Pinus palustris*) occupies about 1-3% of its original range in the southeastern U.S., and has garnered considerable attention with respect to its conservation. Populations upland from the coastal plain (AMontane Longleaf@) are particularly rare. One such population is found on the campus of Berry College in northwest Georgia. As a means of establishing baseline data for a management plan at this site, we censused and mapped trees within five 1-hectare stands, classifying individuals into grass, juvenile, non-reproductive adult, and reproductive adult stages. We measured the CBH of adults, and estimated seed production from cones collected in each stand. Censuses began in 1999 and will take place every two years. So far, we have recorded a total of 115 grass, 28 juvenile, 89 non-reproductive adult, and 332 reproductive adult individuals (some >200 years old), indicating a deficit in recent recruitment. We found grass stages in only two stands, and noted considerable litter build-up, hardwood encroachment, and closed canopy conditions, all due to fire suppression. A wild-fire killed several individuals between 1999 and 2000, pointing to the risk of using controlled burns as a part of a management plan without attention to current dry litter buildup.

235. FISHEL, D. W., J. J. ZACZEK, J. E. PREECE – Southern Illinois University, Carbondale, Illinois 62901-4411—Positional influence on ontogenetic maturity of dormant buds in *Quercus bicolor* and *Quercus rubra*.

Vegetative propagation of superior trees is often preferable to seed propagation. Many woody plant species root poorly if cuttings are from adult forms. Juvenile tissue may be obtained from dormant buds in the lower regions of the trunk. The objective of this research was to assess the vertical gradient of ontogenetic maturity of the dormant bud bank in two species of *Quercus*, and test a method of forcing shoots from dormant buds. Trees were cut into 50 cm sections and placed on mist benches in perlite in a greenhouse under natural light. Shoots were harvested after first flush had set terminal buds and placed under mist and shading. A vertical gradient was clearly apparent in shoot production from sections of both species. *Quercus rubra* shoots were produced at 17 shoots per meter of trunk for the lower 5 meters and continued producing shoots after initial harvest. Rooting averaged 40.3 % and exhibited a strong vertical gradient. *Quercus bicolor* shoots did not root regardless of position. Gradients and rooting varied by genotype.

236. KALINSKY, ROBERT G.<sup>1</sup> AND JOHN GILL<sup>2</sup>. <sup>1</sup>Louisiana State University in Shreveport and <sup>2</sup>City of Shreveport, Shreveport, LA 71115—Phytoplankton assemblages and taste and odor problems in a municipal water supply.

Phytoplankton were collected on a weekly basis at a site near the potable water intake for the City of Shreveport, LA. These collections were identified and quantified in the lab. Taste and odor complaints received by the City of Shreveport Water Treatment facility were recorded during the collection periods. Phytoplankton and taste and odor complaints were statistically



analyzed to determine relationships between the two. We determined that there were no relationships between phytoplankton in the potable water supply and taste and odor complaints. We concluded that phytoplankton do not serve as the source of the taste and odor problems that occur in the City of Shreveport drinking water.

237. LOKUGE, MEEPA A., LU LI, STEPHANIE ROBERTS, KENNETH G. WILSON, AND DAVID A. FRANCKO. Department of Botany, Miami University, Oxford OH 45056–Optimization of 2,4-D concentration for callus induction in cold hardy palms *Trachycarpus fortunei* and *Sabal palmetto*.

The clonal propagation of plants proceeds from a callus phase, through somatic embryogenesis to the production of plantlets. An efficient *in vitro* plant regeneration system could pave the way to genetic transformation of cold hardy palms by the induction of genes that confer desirable characters. According to the literature, callus induction in palms requires the presence of an auxin mainly 2,4- Dichlorophenoxy acetic acid. But even within the same palm species the amount of 2,4 –D needed for callus production varies greatly. In the present study several culture media with different concentrations of 2,4-D and charcoal are being tested for callus induction from zygotic embryos of the cold hardy palms. Effectiveness of the each treatment is evaluated after 2-3 months of culturing based on the percentage of callus production and the embryogenic potential of the callus produced. Activated charcoal is a beneficial component of some palm tissue culture media in the adsorption of the growth inhibitory substances produced. However, charcoal may adsorb growth regulators leading to undefined culture conditions. We are evaluating the adsorptive capacity of charcoal in the medium using spectrophotometric analysis. This will permit determination of effective levels of 2,4-D for callus induction in the presence of charcoal.

238. BOUTIN, ALISON, KATIE KETTLER, ROBIN LEWIS, STEPHANIE ROBERTS, KENNETH WILSON, AND DAVID FRANCKO. Miami University, OXFORD, OH 45056–Accelerated Maturation of *Sabal Palmetto* and *Trachycarpus fortunei* Palms by Optimizing the Application of Growth Regulators Gibberellins and Auxin.

Much work is currently being done at Miami University to increase the cold tolerance of palms, and facilitate their cultivation in temperate climates. The normal 5-10 years palms take to become reproductively mature is too slow for productive genetic experiments. To make testing more efficient we will test the hypothesis that by optimizing gibberellin and auxin ratios and concentrations we can accelerate maturation. Gibberellins are known to accelerate cell wall degradation, promoting stem elongation. Gibberellins and auxin also help initiate flower production. Optimizing these growth regulators is important because hormone uptake and plant response varies greatly between plant species, and little work has been previously done on palms. As a first step in this work, we are evaluating the methods of application, including foliar sprays, injections and lanolin paste techniques on vegetative growth characters. Results are being analyzed by comparing speed of elongation of seedling shoots and overall plant height, as well as overall vigor. The long-term evaluation of these plants lead to an expected outcome of accelerated maturation and flowering of these seedlings.

239. ROBERTS, STEPHANIE M., Bradley D. Raetzke, Robin A. Lewis, Kenneth G. Wilson, and David A. Francko. Dept. of Botany, Miami University, Oxford, OH 45056–Using Cold Assays to Determine if Cold, Nonfreezing Pretreatment Increases Cold Tolerance of Bell Pepper (*Capsicum annuum*).

Survival and yield of bell pepper (*Capsicum annuum*) is greatly affected by cold. To better understand the affects of cold on plants, the lethal temperature must first be established for that plant. This can be done by exposing a plant to progressively lower temperatures and assessing the damage caused. In this current study, cold damage will be

measured two ways, changes in ion leakage and cell viability. Conductivity measures are made to assess ion leakage due to changes in membrane permeability. Trypan blue and fluorescein diacetate are used to assess cell viability following exposure to cold. Once the lethal temperature has been established, tests can be done to determine if cold, nonfreezing pre-treatment can alter the lethal temperatures, as assayed above. The differences between whole plants and plant tissue cultures will be determined. The overall goal of this study is to determine if nonfreezing pretreatment increases pepper plants' or tissue cultures' ability to tolerate freezing temperatures.

240. LU LI, MEEPA LOKUGE, EVA HAGER, STEPHANIE ROBERTS, KENNETH WILSON AND DAVID FRANCKO. Dept. of Botany, Miami University, Oxford, OH 45056—Cold-acclimation response and analysis of cold-tolerant genes in *Trachycarpus fortunei* and *Sabal minor*

The survivorship and growth of many varieties of cold-hardy palms at Miami University (39°30'N) has been demonstrated by previous research. It is necessary now to analyze the mechanism of palms cold-hardness in detail for possible enhancement. An important phenomenon called cold-acclimation permits many plants to increase in cold tolerance after exposure to low nonfreezing temperatures. Cold-acclimation includes the expression of certain cold-induced genes that function to stabilize membranes against freeze-induced injury. We assume cold-hardy palms have cold-acclimation response. To test our hypothesis, we selected *Trachycarpus fortunei* and *Sabal minor* as research models because they are well-known cold-hardy palm species and have survived a severe winter (minimum temp -14°F) in Oxford. We first compared freezing injury between greenhouse-grown and cold-acclimated (exposed to low nonfreezing temperatures for a few days) palms. We will report on the level of cold-acclimation response in these two palm species and the conditions necessary for inducing active expression of potential cold-tolerant genes. A cDNA library will be constructed from cold-acclimated palm mRNA for the purpose of isolating potential cold-tolerant genes. The ultimate goal of this project is to characterize potential cold-hardy genes of palms and enhance genes expression and plant cold-hardness by gene engineering.

241. LEWIS, ROBIN A., STEPHANIE M. ROBERTS, EVA HAGER, KATIE KETTLER, ALISON BOUTIN, KENNETH G. WILSON AND DAVID A. FRANCKO. Dept. of Botany, Miami University, Oxford, OH 45056—Second Generation of Ohio Needle Palms (*Rhapidophyllum hystrix*) via Tissue Culture.

Among palms are presently growing on the Miami University campus *Rhapidophyllum hystrix*, commonly known as needle palm. Needle palm is widely recognized as the most cold tolerant of the Arecaceae, having survived -14 F as well as -20 F elsewhere. Second generation plants will be analyzed for cold tolerance and placed in the field as size permits. Needle palms are an endangered in their native range and propagation of especially cold tolerant individuals we have identified from our field trials is desirable. Using seed collected from campus plants we are evaluating tissue culture techniques to produce embryogenic callus from mature seeds, mature embryos (embryo rescue), and immature embryos. Regenerated clones will be evaluated for differential cold hardiness in the laboratory and especially vigorous plants will be selected for subsequent field trials.

242. WILSON, KENNETH G., MICHELLE WILKERSON, MEEPA LOKUGE, LU LI, STEPHANIE M. ROBERTS, EVA HAGER, KATIE KETTLER, ROBIN LEWIS, ALISON BOUTIN, TODD GORMAN, AND DAVID A. FRANCKO. Dept. of Botany, Miami University, Oxford, OH 45056—Clonal Propagation of Palms for Cold Tolerance Testing in the Laboratory and the Field.

The level of genetic variability of the 100 plus specimens of cold-hardy palms currently in the Miami University Cold-Hardy palm project is not well characterized. Plants have been chosen

to be as representative as possible but there are some examples of individuals that behave differently in the same microenvironment during field tests. Some of the variability is microclimate and some is genetic. This genetic variability could be eliminated from the study if we could develop a series of clones that are derived from a single plant. Furthermore it would be ideal to have clones that have been field tested for eventual commercialization. With this goal in mind we have been testing mechanisms of producing clonal material from several palm species. We report here on progress of studies involving apical buds, developing floral parts, immature and mature embryos, and seedlings.

243. RAFAILL, BARBARA L. Dept. Biological Sciences, Georgetown College, Georgetown, KY 40324–Using a simple botany experiment to teach statistics.

If we expect science majors to be able to design and carry out independent research as part of their undergraduate experience, we must educate them about the place of statistics in science. The role of statistics is better understood when students are able to develop an experiment and carry it out from start to finish in a controlled laboratory setting. A simple, inexpensive, short term experiment primarily aimed at teaching general botany students about the role of gibberellic acid in plants was also used to introduce basic statistics. Students formulated a class hypothesis to be tested, then worked in small groups to collect and analyze data. The described experiment can easily be used to teach many of the principles of experimental design, testing, and reporting including the use of measures of central tendency, a consideration of random and systematic sampling error, development of hypotheses, type errors, significance, t-tests, and ANOVA.

244. GEORGE R. CLINE AND FRANK A. ROMANO, III, Biology Dept., Jacksonville State University, Jacksonville, AL, 36265-1602 – Measurement of species diversity and community similarity in ecology laboratories.

Species diversity measures the biological complexity of a community. Two components of species diversity, species richness and species evenness, are measured separately or in a combined index. Two commonly used indices, the Shannon-Weiner Index and Simpson's Index, are highlighted in this laboratory activity. Three posterboards representing 3 different communities were divided into plots in a 10 x 10 matrix. Species, represented by letters of the alphabet, are distributed throughout each of the communities. Two sampling methods are demonstrated. By assigning codes to rows and columns, students can randomly choose a sample site. This method works well for sessile species. Dredge samples (or hoop net samples) are simulated by tossing a wooden hoop onto the board and recording the species inside the hoop. Students estimate when sampling is complete using cumulative species index. Data from the species diversity lab are used to compare communities using Jaccard's Index and Stander's Index. Students practice the required math skills to quantify species diversity and community similarity in the lab. These skills are applied to field data collected in other labs.

245. WINDELSPECHT, MICHAEL. Appalachian State University, Boone, NC 28607–Online testing: What are the issues and is it effective?

With the increased use of technology in general biology curriculum, many instructors are turning to the use of online testing to evaluate student performance. However, a number of concerns exist on the academic integrity of such a system, as well as the reliability of the technology and impact on instructor time. Furthermore, online classes have traditionally been viewed as a mechanism to increase enrollment, yet little information exists on how to manage high number of online students. A comparison between online and traditional courses provides an insight as what should be expected as well as suggestions on managing instructor time and achieving academic integrity. These procedures are evaluated with respect to class grade distribution in comparison between online and traditional environments.

246. HOLMES GIBRAN<sup>1</sup> AND BARRY PITTENDRIGH<sup>2</sup>. <sup>1</sup>Bowie State University, Bowie MD 20715 and <sup>2</sup>Department of Entomology, Purdue University, West Lafayette, IN 47907 – Understanding the molecular basis of xenobiotic resistance in *Drosophila*.

Regulation of detoxification enzymes is of great importance to understanding how humans metabolize drugs and how insects develop resistance to pesticides. With the availability of metabolically pesticide resistant *Drosophila* lines and the fully sequenced fruit fly genome, scientists are now capable of determining those genes involved in regulation of detoxification enzymes, such as cytochrome P450's. This study was designed to find a regulatory gene(s) that is/are involved in metabolic resistance to pesticides. Thus, a set of *Drosophila* lines, Canton-S and B2, were exposed to DDT for 24 hours. Canton-S fly line was used as the control, and the B2 lines were used because they contained the mutation(s) that codes for DDT resistance. RNA from the *Drosophila* fly lines, Canton-S and B2, were isolated and the process of cloning genes from the B2 resistant line was initiated in an effort to identify the candidate gene(s).

247. SHACK, ALLEN AND DWAYNE WISE. Department of Biological Sciences, Mississippi State University, MS 39762 – Cellular changes in feline kidney cells accompanying infection by lentiviruses.

We have examined the cellular changes that accompany infection of Crandell feline kidney cells by feline immunodeficiency virus. Cells were grown on coverslip cultures in Sykes- Moore or Rose chambers and were observed at 37 degrees C on an inverted phase- contrast microscope. Time- lapse videotapes were recorded at intervals or cells were taped continuously. A series of immunofluorescent double stainings were performed on infected cells using phalloidin, which reacts specifically with actin filaments, and using antibodies against tubulin and p24, a viral protein. These preparations were analyzed using a laser scanning confocal microscope. Living infected cells underwent syncytium formation. In fixed cells, alterations in the cytoskeleton and presence of virus were observed. We hope to be able to correlate changes in cellular morphology with the course of viral infection.

248. HERRON, BROOKS AND DWAYNE WISE. Department of Biological Sciences, Mississippi State University, MS 39762 – Alteration of the metaphase checkpoint by a B-chromosome in the grasshopper *Eyprepocnemis plorans*.

It has been documented that the B-chromosome present in Spanish populations of the grasshopper, *Eyprepocnemis plorans*, has more than forty variants. Of these variants, B5 is known to be a more fit variant of the original B1. B5 was analyzed in our laboratory using the 3F3/2 monoclonal antibody, which binds to a kinetochore phosphoepitope whose degree of phosphorylation is sensitive to tension applied to the kinetochore. Further, the tension created by the spindle at metaphase controls a checkpoint (the "metaphase checkpoint") that allows the cell to begin anaphase when all chromosomes are aligned at the metaphase plate. Fluorescence patterns in cells containing B5 were determined using confocal laser scanning microscopy. The phosphorylation pattern of these cells was shown to be different from that of cells without B5. This suggests that the metaphase checkpoint has been modified in some way. We propose that the fitness associated with the B5 variant is due to alteration of the metaphase checkpoint, which may provide a selective advantage by delaying the onset of anaphase.

249. XUESONG LI, SUSAN R. BARNUM, LINDA E. WATSON. Botany Department, Miami University, Oxford, OHIO 45056 – Phylogenetic relationships among eight heterocystous genera in Cyanobacteria using 23s rRAN gene sequencing.

Ribosomal RNA operons are highly expressed genes and their products have a highly conserved secondary structure. The 23S rRNA coding region is thought to be conservative and thus may be useful for determining higher level phylogeny forming a monophyletic lineage in bacterial. Some cyanobacterial genera can fix nitrogen in specialized cells called heterocysts, A total of 24 strains representing eight heterocystous genera of cyanobacteria was examined using nucleotide sequences of 23S rRNA genes. Sequences were amplified using PCR and cloned. A total of 72 clones from the 24 strains were sequenced and aligned, and an evolutionary tree was constructed using PAUP 4.0. We found that the different strains have a high sequence similarity in the 23S rRNA gene region, and that *Anabaena* and *Nostoc* are the two most closely related genera.

250. LYERLY, BRIAN J. AND MARY U. CONNELL. Appalachian State University, Boone, NC 28607—Analysis of cryptochrome and phototropin genes in the marine brown algae *Scytosiphon lomentaria*.

*Scytosiphon lomentaria* is a marine brown alga that shows a marked seasonality in morphological form. Earlier work has determined that the basal system measures photoperiod and undergoes a morphological change in response to a short day, long night light/dark regime. This response is mediated by blue light but the chemical receptors responsible have not been identified in *Scytosiphon*. Blue light responses are known for a wide variety of organisms and the chemical receptors mediating these responses in land plants have been identified as flavoproteins belonging to the cryptochrome and phototropin groups. Our hypothesis is that these same chemical receptors are responsible for blue light mediated responses in *Scytosiphon*. In order to test this hypothesis, nuclear DNA from *S. lomenaria* has been probed using *CRY 1*, *CRY 2*, and *NPH 1* gene probes amplified by PCR from *Arabidopsis thaliana* DNA. Results indicate that all three genes are present in *Scytosiphon*. In addition to this work, RNA analysis and sequence data will be presented.

251. CARIVEAU, MICKAEL J.<sup>1</sup>, XIN H. HU<sup>1</sup>, QIYING FANG<sup>1</sup>, AND GERHARD W. KALMUS<sup>2</sup>. <sup>1</sup>Dept. Physics and <sup>2</sup>Dept. Biology, East Carolina University, Greenville, NC 27858—Efficacy of cutaneous pigment removal using a low energy Nd:YAG laser at 1064nm.

Current approaches of efficient tattoo removal utilize visible and near infrared nanosecond (ns) laser pulses with an energy of 300mJ or larger. The production of laser pulses at this energy require large Q-switched lasers and result in significant collateral tissue damage. A more efficient method is needed to treat cutaneous pigmented lesions using ns laser pulses with much smaller pulse energies. Two Yucatan micropigs were tattooed with black, blue, green and red ink to establish the animal model. A focused beam from a pulsed Nd:YAG laser was then used to disrupt the tattoo pigment. Each tattoo was exposed to 12ns laser pulses at a wavelength of 1064nm with different focal depths. The pig was translated perpendicular to the beam to achieve a single pulse per ablation site within the skin. The pulse energy was reduced to a range from 49-63mJ. Results indicate that pigment disruption was complete for blue and black pigments and incomplete for red and green pigment. Punch biopsy's were taken post-treatment for 28 days for histological examination. Results will be presented and the efficacy of using ns laser pulses for tattoo removal will be discussed.

252. SHULL, J. K. AND B. A. HUDSON. Department of Biology, Appalachian State University, Boone, NC 28608-2027 — Meiotic synchrony in the a diploid and autotetraploid *Ornithogalum virens* (Anthophyta: Hyacinthaceae).

*Ornithogalum virens* has an inflorescence consisting of a spike of flowers in three whorls. The flowers mature from base to apex of the inflorescence. The plant has a low chromosome number ( $2n = 6$ ) and large chromosomes. This study has established that in the diploid, (1) meiosis is synchronous within a bud from pre-leptotene through early diplotene, and (2) there is

a smooth gradation in meiotic stage from one bud to the next in the same whorl. This allows us to predict the stage of meiosis that will be found in a given bud, provided that an adjoining bud has been sampled. Meiosis shows markedly reduced synchrony within a bud in the autotetraploid, and no smooth gradation in meiotic stage from one bud to the adjoining bud. With a low chromosome number, large chromosomes, meiotic synchrony within a bud, and the smooth gradation in meiotic stage from one bud to the next, this plant is an ideal subject for cytogenetic studies, some of which are underway in our laboratory.

253. STEVEN J. COGGIN AND KEVIN HART. Department of Biology, Catawba College, Salisbury, NC 21844 – Allometric Scaling of Flagella in Volvocine Algae.

Green algae in the order Volvocales exhibit a wide range organism size, cell number, complexity of development and degree of differentiation. The Volvocales range in size from the unicellular *Chlamydomonas* with a cell diameter of 10  $\mu\text{m}$  to the multicellular members of the genus *Volvox* with over one thousand cells in a spheroid and size of more than a millimeter. Niklas (1994) has shown these algae exhibit allometric scaling in their size, settling rate and swimming speed. These algae are motile by means of two flagella on each cell. We examined the scaling relationship between flagella length and organism size for *Chlamydomonas reinhardtii*, *Pandorina morum*, *Pleodorinda californica*, *Gonium pectorale*, *Platydorina caudatum* and *Volvox carteri*. In this group of algae the length of flagella scale with an exponent of  $\sim 0.65$ . This value agrees with the  $2/3$  power-law scaling relating surface area to volume. Therefore, the length of flagella in the Volvocales is directly related to organism size.

254. HAGER, EVA, Lu Li, Stephanie M. Roberts, Kenneth G Wilson, and David A. Francko. Department of Botany, Miami University, Oxford, OH 45056 – Isolation and Characterization of Cold-tolerance Genes in Palms (Arecaceae).

Although palms are normally considered tropical plants, *Trachycarpus fortunei*, *Sabal palmetto*, and *Rhapidophyllum hystrix* have exhibited cold tolerance to USDA Plant Hardiness Zone 6a. Cold temperatures induce the expression of certain genes thought to be involved in various mechanisms of cold response. In order to better examine these mechanisms in palms, we searched for genes with homology to the dicot *Arabidopsis thaliana* *cor* gene family and the *afp* genes found in the monocot *Lolium perenne*. We report the isolation and characterization of cold-tolerance genes in palms homologous to genes in *Arabidopsis* and *Lolium*. These results indicate that there is a genetic basis for cold tolerant palms' survival in colder growth conditions. This research was supported by a Miami University Academic Challenge Grant.

255. IZZO, INGRID, MALCOLM COLBERT, MICHELLE GREENE, AND CHRISTI MAGRATH. Dept. of Biological and Environmental Sciences, Troy State University, Troy, AL 36082—The effect of lead of *Saccharomyces cerevisiae*: towards the identification of lead responsive genes.

The toxic and persistent nature of lead in the environment creates a need for the development of non-chemical cleanup methods, and the use of *Saccharomyces cerevisiae* that has been genetically engineered for maximum lead bioabsorption may potentially provide a benign solution for a toxic problem. To facilitate development of yeast strains capable of maximal lead uptake, specialized leaded media was developed using rich media supplemented with either lead dissolved in nitric acid or lead acetate. Culturing of cells on plates with concentrations of lead varying from 0 to 240 parts per million allowed the toxic dose of lead to be assessed. Additional samples were analyzed to determine the effect of pH, temperature, and chemical nature of the lead source. Based on the ability of lead acetate to significantly retard the growth of the cells without significant contributions from pH, temperature, or chemical nature, genetic investigations of lead acetate treated cells were initiated. Several approaches are being used to isolate cells or strains that are either sensitive or resistant to lead acetate treatment,

including screening of a collection of yeast deletion strains and analysis of cells transformed with a yeast genomic library, with the goal of identification of lead responsive genes. Support for this project was provided by the Troy State University Foundation, the TSU Department of Biological Science, and the Alabama Department of Public Health ALERT Grant.

256. FRAZIER, LAURI, KIANA BRADLEY, AND CHRISTI MAGRATH. Dept. of Biological and Environmental Sciences, Troy State University, Troy, AL 36082—The effect of varying levels of transcriptional interference on replication in *Saccharomyces cerevisiae*.

The goal of this project is to explore the possibility that the transcription termination signals that are found within the autonomous replication sequences (ARS) of *Saccharomyces cerevisiae* act as molecular shields. For this study, a promoter capable of providing a wide range of transcription levels is positioned upstream of a plasmid-based autonomous replication sequence. Considering the previously reported innate ability of ARSs to terminate transcription, this system enables us to monitor replicative efficiency as a function of both transcription levels and transcription termination levels and to determine the effects of intermediate degrees of transcription. Using different plasmid constructs, including plasmids containing ARSs in various orientations and ARSs containing mutations that effect transcription termination, plasmid loss assays were performed and data on replication efficiency interpolated. Regardless of the nature of the ARS sequence, levels of plasmid loss increases as transcription increases. In the presence of the point mutation, replication is less efficient than in a mutation-free construct. Therefore, the level of replication efficiency measured by plasmid loss analysis directly correlates with the expected level of transcriptional readthrough, providing evidence for a potential role of transcription terminators as molecular shields. Support for this project was provided by the Troy State University Foundation, the TSU Department of Biological Science, and the National Science Foundation (CAREER Grant 9985156).

257. SHERIDAN, SEAN AND J. KENNETH SHULL, JR. Department of Biology, Appalachian State University, Boone, NC. 28608 – The use of visual cues in determining mate choice in female *Drosophila melanogaster*.

Although it has been shown that, during courtship, wing vibration plays an important role in female mate choice, our laboratory has shown that the females from a variety of mutant stocks apparently pay little or no attention to the “song” generated by the wing vibration of males. Since vestigial winged males cannot generate a normal song, it would be expected that females would choose wild-type males preferentially over vestigial males. In over 60 trials in which mating took place in the light, females from a vestigial winged stock showed no preference for wild-type males to vestigial males. In similar trials in which the wings of the wild-type males were removed, females still showed no preference of one type of male over the other. In over 20 trials in which mating took place in the dark, females chose wild-type males over vestigial males in over 80% of the cases. This indicates that the females are using some visual cue to judge male fitness, at least in some cases.

258. MAYRHOFER, MARIA, M. P. ROWE AND J. K. SHULL. Department of Biology, Appalachian State University, Boone, NC 28608-2027 – Sexual selection in certain mutant stocks of *Drosophila melanogaster*.

In a continuation of our studies of female mate choice in *Drosophila melanogaster*, we studied five stocks mutant for various wing mutations: vestigial (vg), apterous (ap), dumpy (dp), scalloped (sd) and miniature (m). In each case we offered the mutant females males of the same phenotype and wild-type males. For vg, dp, and sd female mate choice was not significantly different from females showing no preference. This would not be expected if wing vibration played a major role in mate choice. Apterous and miniature females showed a strong



preference for wild-type males. The data concerning vg supports the conclusions of Lindfors *et al* (2000) which indicated that vestigial females had no preference between wild-type and vestigial males. When the data for dp are combined with that of Lindfors *et al* it appears that dp females select wild-type males over dp males. When the experiment was repeated in the dark, both vg and ap females showed a strong preference for wild-type males, indicating that these females may be using a visual cue in mate choice.

259. RAJ BOOPATHY AND RICHARD MARTIN. Biological Sciences, Nicholls State University, Thibodaux, LA 70310 – Enhanced Biotransformation of Carbon Tetrachloride Under Mixed Electron Acceptor Conditions.

The anaerobic biotransformation of carbon tetrachloride (CT) under various electron acceptor conditions was investigated using enrichment cultures developed from the anaerobic digester sludge of Thibodaux sewage treatment plant. The results indicated that CT was biotransformed under sulfate reducing, methanogenic, fermenting, and mixed electron acceptor conditions. However, the rates of CT removal varied among the conditions studied. The fastest removal of CT (100% removal within 18 days) was observed under mixed electron acceptor conditions, followed in order by sulfate reducing, methanogenic, and fermenting conditions. Under nitrate reducing conditions, the CT was not biotransformed. Under mixed electron acceptor conditions, the CT was converted to chloroform, methylene chloride, methyl chloride, and chloromethane. Similar metabolites were observed under sulfate reducing and methanogenic conditions. This study showed evidence for CT metabolism in a mixed microbial population system similar to any contaminated field sites, where heterogeneous microbial population exists.

260. CURTIS, ELISABETH AND LAJOYCE H. DEBRO. Department of Biology, Jacksonville State University, Jacksonville, AL 36265–Association of gene sequences with inclusion proteins of *Bacillus thuringiensis* subspecies *finitimus*.

*Bacillus thuringiensis* subspecies *finitimus* is unique among insecticidal strains of bacteria. The bacterium produces at least two crystalline parasporal inclusions. One inclusion is released in the environment separately from the spore and the second atypical inclusion remains with the spore inside a common envelope, the exosporium. Two genes, *cry26* and *cry28*, have been cloned from this strain but neither of the genes has been specifically associated with the enclosed or the free inclusion proteins. The objective of this study was to use PCR to correlate the cloned *cry* genes with specific inclusion proteins of *B. thuringiensis* subsp. *finitimus*. Template DNA was isolated from *B. thuringiensis* subsp. *finitimus* and plasmid variants of subspecies *finitimus* that produce or fail to produce enclosed inclusions. PCR primers were designed from the published sequences of *cry26* and *cry28*. PCR results show that both genes correlate with a large 98-mDa plasmid of subspecies *finitimus* and exosporium enclosed parasporal inclusions. The *cry28* sequence is repeated on a 77-mDa plasmid but alone is not sufficient to direct the formation of an enclosed inclusion. *B. thuringiensis* subspecies *irapuatensis* also produces enclosed inclusions but PCR failed to identify *cry26* or *cry28* sequences in this strain.

261. SOMERVILLE, CHARLES<sup>1</sup> AND MICHAEL LABARE<sup>2</sup>. <sup>1</sup>Marshall University Department of Biological Sciences, Huntington, WV 25755 and <sup>2</sup>The United States Military Academy Department of Chemistry, West Point, NY 10996 – Transformation of nitroaromatic compounds by *Pseudomonas pseudoalcaligenes* JS52.

*Pseudomonas pseudoalcaligenes* strain JS52 grows on nitrobenzene as a sole source of carbon and energy. In most cases the addition of a second nitroaromatic substrate (0.25 mM) inhibited the growth of strain JS52 ( $p < 0.05$ ). However, the addition of 2,3-dinitrotoluene significantly increased cell yield ( $p < 0.10$ ), indicating some metabolism of this compound. Resting cells of JS52 grown on nitrobenzene transform nitrophenols, dinitrotoluenes, 4-

nitrotoluene, 4-nitrobenzaldehyde, and 4-nitrobenzyl alcohol to uncharacterized products. A novel nitroreductase, designated NRII, was purified and characterized from strain JS52. The enzyme has a molecular mass of 30 KD, a flavin:protein molar ratio of 1:1, and produces nitrosobenzene and hydroxylaminobenzene from nitrobenzene in the presence of NADPH. NRII also reduces 4-amino-3-nitrotoluene, nitroanilines, 4-nitrobenzaldehyde, 4-nitrobenzyl alcohol, nitrophenols, nitroquinone, nitrotoluenes, nitrobenzoates, dinitrobenzenes, dinitrotoluenes, trinitrobenzene, and trinitrotoluene.

262. VAN METER, SAMUEL AND CHARLES SOMERVILLE. Marshall University Department of Biological Sciences, Huntington, WV 25755 – Antimicrobial activities of bacteria associated with medicinal plants.

Many plant extracts are known to have antimicrobial activity. Recent reports suggest that bacteria associated with plant tissues produce some of the inhibitory chemicals in these extracts. We isolated bacterial symbionts of *Ginkgo biloba*, *Echinacea magnus*, and Elephant Garlic and tested their ability to produce antimicrobial compounds. Plant tissues were dissected under aseptic conditions and sampled using sterile cotton swabs. Recovered bacterial cells were transferred to Casamino Dextrose Broth (CDB) and incubated for 24 h at room temperature. Cells were removed from these cultures by centrifugation at  $16,000 \times g$  for 30 minutes, and the culture supernatants were tested for antimicrobial activity. Inhibition tests were initiated by streaking a bacterial or yeast culture onto Tryptic Soy Agar (TSA) for confluent growth. A sterile cork-borer was then used to create a well in the agar plate to which 75  $\mu$ l of culture supernatant was added. The plates were incubated overnight and inspected for inhibition of the test strain. The yeast *Candida albicans* was inhibited by bacteria isolated from garlic. The Gram-positive bacterium *Micrococcus luteus* was inhibited by bacteria isolated from Ginkgo and Echinacea. Future work will include identification of the bacterial isolates as well as the inhibitory chemicals they produce.

263. LAYNE, GINGER AND CHARLES SOMERVILLE. Marshall University Department of Biological Sciences, Huntington, WV 25755 – Antimicrobial activities in extracts of Ginkgo, Kudzu, and Clover.

Widespread use of antibiotics in both medical and agricultural applications has led to a proliferation of resistant microbial strains. These resistant strains have, in turn, sparked renewed interest in the discovery of novel chemicals with antimicrobial activity. In this study, plants with known medicinal applications and plants of regional interest were tested for antimicrobial activity. Ethanol and petroleum ether extracts were made of Ginkgo leaves and seeds, Kudzu leaves, and Clover sprouts. In addition, hot water extracts were made from Ginkgo leaves and seeds. Each extract was tested against *Candida albicans*, *Salmonella enteritidis*, *Escherichia coli*, *Micrococcus luteus*, *Vibrio fischeri*, *Pseudomonas aeruginosa*, and *Serratia marcescens*. Kudzu appeared to be the most potent inhibitor of microbial growth. Both ethanol and petroleum ether extracts of Kudzu inhibited all seven test organisms. Organic extracts of both Ginkgo and Clover Sprouts also inhibited numerous strains, but the hot water extracts of Ginkgo inhibited only *M. luteus*. Previous studies in our lab tested only water extracts of medicinal plants, but organic extracts appear to be a much more likely source of antimicrobial chemicals. Extracts with demonstrated antimicrobial activity are being resolved by HPLC in an attempt to identify the active compounds.

264. WATKINS, RICHARD M. AND LAJOYCE H. DEBRO. Department of Biology Jacksonville State University, Jacksonville, AL 36265–Subcloning a gene for parasporal inclusion protein of *Bacillus thuringiensis* subspecies *finitimus*.

*Bacillus thuringiensis* subspecies *finitimus* is unique among strains of *B. thuringiensis*. The bacterium produces at least two crystalline (Cry) parasporal inclusions. One inclusion is

released into the environment separate from the spore, and the second atypical inclusion remains with the spore inside a common envelope, the exosporium. The mechanism for targeting inclusion proteins within the exosporium is not known and was the basis of this research. Previously a *cry28* gene from subspecies *finitimus* was cloned and expressed in *E. coli*. The objective of this study was to subclone *cry 28* into the shuttle vector pHT3101 for replication and expression in both *E. coli* and *B. thuringiensis*. Primers with restriction enzyme sites incorporated into the 5' termini were designed from the DNA sequence to anneal in the non-coding regions surrounding the gene. Long PCR was conducted using a polymerase with proof reading ability to reduce errors. The PCR product and pHT3101 were digested, directionally ligated, and used to transform *E. coli*. One clone was selected and confirmed by PCR with gene specific primers and RFLP. This study continues with electroporation of the recombinant plasmid into *Cry*<sup>-</sup> variants of *B. thuringiensis* to monitor expression of *cry 28* with respect to the exosporium.

265. GASS, CARRIE B AND LEON L. LUNDIE. Appalachian State University, Boone , NC 28608—Temporal diversity of bacterial populations during initial colonization of substrate.

The colonization and subsequent breakdown of organic substrates by bacterial populations is known to play an integral role in the input of nutrients into aquatic systems. The temporal diversity of bacterial colonizers on a glass substrate was investigated in a freshwater stream. Samples were collected at predetermined intervals, rinsed with sterile water and aliquoted onto low-nutrient agar. After an incubation period of 48 hours at 28 C, the number of colony-forming units was recorded. Ten isolated colonies per time interval were picked based on differences in simple morphological features. Each was Gram-stained and assayed for utilization of carbon sources in order to determine diversity. Preliminary results show increasing bacterial density on the slides until the 400 hour interval at which point bacterial density showed a significant decrease. High bacterial diversity is observed at 6, 12, and 49 hours after colonization begins with subsequent decrease in diversity over time.

266. SPRATT, HENRY G., Jr. Department of Biological and Environmental Sciences, University of Tennessee, Chattanooga, TN 37403—Comparison of the impact of timber harvest by clear-cutting and selective-harvest on surface soil microbial activity and nutrient cycling.

The impact of harvest by clear-cutting or selective-harvesting was addressed for surface soils in 18 permanent southeastern Missouri plots from May 1995 to June 1999. Clear-cutting (C-C) or selective-harvesting (SH) occurred on 12 of the plots in 1996. Total C and S were determined by elemental analysis. Exchangeable K and Mg were determined using AA. Mineralization of <sup>14</sup>C-lignocellulose, and incorporation of <sup>35</sup>SO<sub>4</sub> into organic matter were used to measure microbial activity. Total C and S, exchangeable K and Mg all decreased in C-C soils and SH soils (located low in the landscape) compared with controls (by 45%, 35%, 250%, and 20%, respectively). These elements in SH sites located high in the landscape were more like controls. Lignocellulose mineralization was somewhat reduced post-harvest in all disturbed soils. However, microbial biomass production was nearly 80% lower post-harvest in CC sites and in SH soils low in the landscape. These data suggest that by 3y-post disturbance loss of organic matter and Mg and K from surface soils resulted in reduced microbial biomass production, while having minimal impact on microbial catabolic activities. This research was supported by grants from the Missouri Department of Conservation and the USDA, NRICGP.

267. RAYBURN, JAMES. Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 — Preliminary background contamination and developmental effects using FETAX from sites around the Anniston Army Chemical Weapons Incinerator.

The chemical weapons disposal at the Anniston Army Depot (ANAD) has raised the concerns of possible health effects in the surrounding community. The US army has an incinerator similar to the one being built at the ANAD in Utah and it has raised public concern over possible health effects. Because emissions travel from the incinerator to be deposited at sites away from the incinerator, a monitoring program that looks not only at the incinerator site but also at sites further away would be in the overall public interest in determination of possible exposures. Nine potentially toxic metals and poly-chloro-biphenols were analyzed from water, soil samples using atomic absorption spectro-photometer and gas chromatography. In addition, the Frog Embryo Teratogenesis Assay-*Xenopus* (FETAX) was employed to determine developmental toxicity at these sites. This proposed project would investigate not only these potential emissions at sites around the incinerator but also the possible health effects of the incinerator by the use of FETAX. Therefore, this project is the first phase to examine the potential environmental risk from the disposal of chemical weapons and associated hazardous waste by incineration.

268. ALADDIN, RANDA K. AND RAYBURN, JAMES R. Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 and State University—Toxicity of Phloxine B on the Developing Embryos of *Xenopus laevis*.

This study is to determine the phototoxicity of Phloxine B(a xanthene dye; i.e. D&C Red Dye No. 28; i.e. 2',4',5',7'-tetrabromo-4,5,6,7-tetrachlorofluorescein disodium salt) on developing frog embryos. It is a colorant that can be found in cosmetics and edible drugs. This chemical is also being used for pesticide use to control insects, worms, and bacteria. Light absorption of this chemical occurs in the visible region of the spectrum and activated when organisms ingest or absorb the dye, causing tissue degradation. Phloxine B's teratogenic potential was assessed with a standardized developmental toxicity protocol FETAX (Frog Embryo teratogenesis Assay—*Xenopus*). This 24-hour static renewal system was utilized treatment groups, which included exposure in the light and dark. Embryo survival was recorded daily and malformations assessed at the end of 96 h. Light exposures had an average LC50 of 12.0 mg/L, EC50 of 30.0 mg/L, and TI of 0.61. Dark exposures had an average LC50 of 103.0 mg/L, EC50 of 44.0 mg/L, and a TI of 14.0. This study is to understand the toxicological effects caused by addition of this phototoxic chemical to the developing organisms.

269. HERR, J. M., JR. AND MIHÁLY CZAKÓ. Dept. of Biological Sciences, University of South Carolina, Columbia, SC 29208 – Wood Structure in *Dalbergia glabra* Standl. and *D. brownei* Schinz

The wood of both species is composed primarily of nonstoried, libriform fibers surrounding broad vessels that occur singly or in groups of 2 to 6 in linear, radial files. Vessel diameter diminishes as each file extends toward the periphery of the stem. Vessel elements are barrel-shaped with an alternate arrangement of simple pits in the side-walls and simple, broad perforations in the flat end-walls. The axial parenchyma occurs in storied, concentric, apotracheal bands that randomly surround vessels so to become paratracheal, aliform-confluent. Simple pits are abundant in the radial walls and rare in the tangential walls of the parenchyma cells. The rays may be uni-, bi-, or multiseriate. They are homocellular and composed of procumbent cells with simple pits. The wood of *D. brownei* is ring-porous with twice as many single than radially grouped vessels in both early and late wood. *D. glabra* is diffuse-porous with single and grouped vessels equally represented. Biseriate rays are predominant in both species ( $12/\text{mm}^2$ ) with more uniseriate ( $8/\text{mm}^2$ ) and fewer multiseriate ( $3/\text{mm}^2$ ) in *D. brownei* than in *D. glabra* ( $1/\text{mm}^2$  and  $7/\text{mm}^2$ , respectively). Mean ray height is greater in *D. glabra* ( $191\ \mu\text{m}$ ) than in *D. brownei* ( $138\ \mu\text{m}$ ).

270. PENDERGRASS, DARRYL C., GEORGE CLINE AND JAMES R. RAYBURN, Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 – Comparison of the Effects Nitrogen Compounds on the Development of *Xenopus laevis* and *Pseudacris crucifer*.

With nitrate and ammonium compounds being a major component of non point-source agricultural pollution, we need to assess the possible effects of these compounds on the development of amphibian larvae. The Frog Embryo Teratogenesis Assay *Xenopus* (FETAX) methods were used to assess developmental toxicity to two frog species. FETAX can be used as an accurate indicator for the possible developmental effects of nitrogen containing compounds on native Anuran larvae. This study is a comparison of the effects of nitrate and ammonium compounds on the early development of *Xenopus laevis* and *Pseudacris crucifer*. Comparisons of the LC50, EC50 and malformations caused by Ammonium nitrate, Potassium nitrate and Ammonium Chloride on the development of both *Xenopus laevis* and *Pseudacris crucifer*.

271. POPE, CHAD P.<sup>1</sup>, SCOTT B. FRANKLIN<sup>1</sup>, AND BEVERLY COLLINS<sup>2</sup>. <sup>1</sup>Dept. of Biology, The University of Memphis, Memphis, TN 38152 and <sup>2</sup>Savannah River Ecology Lab, Savannah, GA 29802–Effects of disturbance frequency and intensity on old field succession.

Disturbance of varying frequency and intensity has been shown to have a profound effect on species composition in plant communities. Two theories were of interest. The intermediate disturbance hypothesis suggests that species diversity will be greatest at some intermediate level of disturbance. Secondly, disturbance may be the driving force behind the assembly of some plant communities. We altered disturbance frequency (from twice per year to once every four years) and intensity (all species or only dominant species removed) in a newly ploughed field to test their separate and interactive effects, beginning in 1991. Results from a resample in the fall of 2000 suggest that frequency plays a greater role than intensity in determining species diversity and community composition. However, the data are obviously affected by the spatial colonization of individuals and their subsequent spread, especially *Rubus* species. We are currently examining the spatial structure of the succeeding field.

272. PAULK, ERIC<sup>1</sup>, MARTIN L. CIPOLLINI<sup>1</sup>, AND DONALD F. CIPOLLINI<sup>2</sup>. <sup>1</sup>Department of Biology, Berry College, Mount Berry, GA 30149 and <sup>2</sup>Wright State University, Dayton, Ohio 45435 – Effect of nitrogen and water treatment on leaf chemistry in Horsenettle (*Solanum carolinense*), and relationship to herbivory by flea beetles (*Epitrix* spp.) and Tobacco Hornworm (*Manduca sexta*).

We are studying the interaction between a plant (Horsenettle; *Solanum carolinense*), and two herbivorous insects (Flea Beetles; *Epitrix* spp., and Tobacco Hornworm; *Manduca sexta*). We focus this study on three questions: 1) How does variation in nitrogen, water, and maternal plant affect leaf chemistry?, 2) Does variation in leaf chemistry affect feeding by either insect?, and 3) Is there evidence of a potential interaction between the insects that may be mediated by leaf chemistry? From 1998-2001, we have grown three replicated clones of 10 maternal plants under two nitrogen treatments and two water treatments. For each plant in the summer of 2000, we assayed herbivory by hornworms in both indoor (detached leaf) and outdoor (whole plant) assays, as well as ambient flea beetle damage. Estimates of leaf material consumed were made using analysis of digitized leaf images. We also assayed leaves from each plant for total protein, phenolic, and glycoalkaloid content, and for trypsin protease inhibitor and peroxidase activity. We found no effects of plant treatment or maternal plant on feeding by either insect. However, we did find a negative relationship between flea beetle damage and subsequent feeding by hornworms, a negative interaction that may have been mediated by induced changes in plant chemistry.

273. DILUSTRO, JOHN, BEVERLY COLLINS, LISA DUNCAN, REBECCA SHARITZ, J. VAUN MCARTHUR, CHRIS ROMANEK AND JOHN SEAMAN. Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29802 – Thresholds of disturbance: Land management effects on vegetation and nitrogen dynamics.

Military training and forest management practices create disturbances that affect vegetation and nitrogen dynamics. We will use an experimental approach to compare military use (heavier vs. lighter) and forest management treatments [4 combinations of burning (2 year cycle vs. 4 year cycle), and thinning (thinned vs. left unthinned through the research period)] between sites on sandy and clayey soils in Ft Benning, Georgia. Thirty-two sample plots (100m by 100m) were established. Prior land use, including historical land use and the recent history of forestry practices and military use has influenced each of the 32 sites. We conducted a pre-treatment vegetation survey for baseline plant community structure and species composition to evaluate effects of prior land use. Preliminary analyses indicate higher tree density on sites with lighter vs. heavier military training. The range of tree density is greater on clayey soil than sandy soil, which suggests a greater effect of disturbance on tree density on clayey soil. Groundcover density is similar for both soil types (42% cover). Understanding the interactions among these land use practices can guide management practices to enhance forestry and military use goals.

274. HELMS, BRIAN<sup>1</sup>, JOHNNY RANDALL<sup>1</sup>, and ALÄA WALLY<sup>2</sup>. <sup>1</sup>North Carolina Botanical Garden, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599 and <sup>2</sup>Archbold Biological Station, Lake Placid, FL, 33862 – Does fire management affect the vegetation structure of a remnant diabase glade community in Durham, NC?

Penny's Bend Nature Preserve, located along the Eno River northeast of Durham, North Carolina, contains remnant diabase glade communities. These glades contain several rare prairie disjunct species, including *Baptisia minor* var. *aberrans*. In November of 1999, a prescribed burn was implemented as an alternative to 12 years of annual mowing in order to promote glade flora, prairie-like vegetation composition and structure, and to inhibit the encroachment of exotic pest plants. To assess the effects of fire mangement, vegetation surveys were conducted in six 10m x 10m modules during the summer of 1999 and 2000. Three modules were mown and three were burned in November 1999. By the summer of 2000, community similarity (Jaccard Index) between the two treatments dropped from 83.5% to 59.4% while proportional similarity (based on percent vegetation covers) dropped from 43% to 28%. Also, *B. minor* crown quality was significantly higher in the burn treatment in 2000 ( $p=0.054$ ). There were however no significant differences in the percent cover of any plant species between the two treatments. These results suggest that, although expected and desired effects of fire seem to be occurring, several more years of observation will be needed to determine the full effects of prescribed fire mangement.

275. ALLEN, BRUCE P., and REBECCA R. SHARITZ. Savannah River Ecology Laboratory – Forest population dynamics in seven southeastern floodplain forests.

Secondary forest succession in floodplain forests was examined in seven 1 ha plots over a 16 year period. In 1979, plots were established along a hydrologic gradient on small and large river floodplains of the Coastal Plain of South Carolina. Woody stems  $\geq 4.5$  cm were measured and mapped in 1979 and remeasured in 1989 and 1995. Patterns of survival, growth, and recruitment of canopy species may indicate paths of succession in floodplain forests. Changes in the size-class distribution for all trees indicate that mean tree diameter is increasing while density decreases. Size class distribution in Cypress-Tupelo stands, where species richness is much lower, have modal distribution. Ingrowth to mortality ratios ( $\geq 1.0$ ) indicate that shade tolerant subcanopy species (*Ilex opaca*, *Ilex decidua*, *Cornus florida*) and woody vines (*Vitis rotundifolia*) are increasing in density. Only a few potential canopy species have had ingrowth

to mortality ratios  $\geq 1.0$ , including *Acer rubrum*, *Fagus grandifolia*, *Quercus nigra*, and *Quercus laurifolia*.

276. LEWIS, MARK J., L. M. BOWE AND D. L. SHUMWAY. Dept of Biological Sciences, Frostburg State University, Frostburg, MD 21532 – Effects of the canopy opening on the understory of an old growth eastern hemlock-northern hardwood forest in south-central Pennsylvania.

This study describes changes occurring in an old-growth hemlock-dominated forest due to an infestation of the hemlock woolly adelgid (HWA; *Adelges tsugae*). The Sweet Root Natural Area in south central Pennsylvania includes a steep, boulder-covered gorge which harbors such rare or special plants as the *Dryopteris campylopteris*, *Dicentra exima* and *Taxus canadensis*. Loss of foliage and large falling trees due to the HWA has resulted in an opening of the canopy, increased coarse woody debris and an influx of the *Betula alleghaniensis*, *Acer rubrum* and other successional species. ANOVA was used to compare the importance values of eight ten-meter nested plots and tree-ring analysis was used as an indicator of growth changes before and during the HWA infestation. *Taxus canadensis* clones were measured and PCR and DNA sequencing of phytocrome and glyceraldehyde phosphate dehydrogenase were used to identify ramets and genets. These clones were then monitored to determine the effects of the canopy opening on individuals versus clones. Results of our study indicate drastic long-term changes and loss of important species due to HWA and support the need for timely and extensive research of biological and other control agents.

277. DANE KUPPINGER AND JAKE WELTZIN, University of North Carolina-Chapel Hill AND University of Tennessee-Knoxville – The state of alien invasive plant knowledge and control on managed lands of the southern appalachians.

While invasive alien plant species have begun to attract the attention of land managers, researchers, and government agencies, until now there has been no documentation as to the extent of the invasive species problem in the Southern Appalachians. To this end, as part of its Invasive Pest Plant Initiative, the Southern Appalachian Man and Biosphere program initiated a survey of 44 state, federal, and non-governmental agencies to determine the extent of land manager's awareness of the problem and the degree to which control efforts have been undertaken. Results indicate that there is a great deal of variation in the depth and breadth of knowledge about plant invasions among agencies. Although some land managers have no knowledge as to the existence (or lack of) invasive plant populations on their properties, most have compiled at least partial lists of their invasive species, and some have prioritized these lists for control, but few have population data, and control efforts have generally been limited. Although a total of 263 plant species were reported as invasive in the region, many managers identified a much smaller subset of species as highly invasive. The survey also compiled a list of Southern Appalachian land managers and researchers working on invasive species as well as a list of resources and pertinent available information.

278. BROOKS, JANIE S. Dept. Ecology and Evolutionary Biology, Cornell University, Ithaca, NY 14853 and Div. Environmental Studies, Mathematics, and Natural Sciences, Brevard College, Brevard, NC 28712 – Intraspecific variation in volatile profiles of *Daucus carota* genotypes in response to resource availability.

Frequently, the levels of carbon-based secondary metabolites are inversely related to nitrogen content in plant tissues. Fertilization tends to increase amounts of nitrogen-based secondary compounds and decrease concentrations on carbon-based compounds. The most comprehensive mechanistic model that has been advanced to explain this apparent pattern is the growth/differentiation balance hypothesis (GDBH), which addresses the physiological and developmental tradeoffs in plant allocation between growth and chemical and structural defenses. Yet, experimental attempts to prove this hypothesis have met with mixed success. In



this study, a fertilization experiment was conducted to examine the role of plant nitrogen in determining levels of plant volatiles in two *Daucus carota* (domesticated carrot) cultivars. Previous work on leaf-surface chemistry of different *D. carota* cultivars revealed that the concentrations of volatiles in various genotypes were negatively correlated with plant nitrogen content. The results of my study highlight an important complicating factor in interpreting results from manipulation experiments: the presence of intraspecific, genotypic variation in plant response to fertilization.

279. KEELEY, M.T., J. J. ZACZEK, J. E. PREECE - Southern Illinois University, Carbondale, IL 62901-4411 – Variability of sap volume and sugar concentration among silver maple (*Acer saccharinum* L.) trees within upland plantings and riparian zone forests.

Maintaining forested riparian zone buffers along streams can attenuate agricultural runoff and diversify the landscape. We investigated the feasibility of using silver maple, an underutilized native riparian zone species, for the production of maple syrup. SSC and sap volume was sampled from silver maple trees in a 10 year-old plantation and within forested riparian zones in southern Illinois. Plantation design was a randomized complete block (4), with 15 provenances, and 6 clones per provenance. In winter 2000, 314 plantation trees were tapped and SSC was measured on 6 dates. Volume was summed over the sap flow season. SSC and volume differed among provenances ( $p > 0.001$ ) and among clones within provenances ( $p > 0.001$ ). SSC for clones ranged from 1.0% to 2.0% (mean = 1.43%). Sap volume ranged from 5.0 to 2,723.4 ml among clones (mean of 561.2 ml). Tree basal area was positively correlated ( $r = 0.63$ ) with volume. Provenance latitude accounted for 8% of the variation in SSC and 9% of the variation in volume. Native trees ( $n=31$ ) in riparian forests averaged 1.61% (range 1.0 to 2.3%) in SSC. Results suggest that selected silver maple individuals in uplands or riparian zones could be used for producing maple syrup.

280. MURRELL, ZACK E. Department of Biology, Appalachian State University, Boone, NC 28608 – Planning for the future: herbaria in the 21<sup>st</sup> century.

Many small and large herbaria in the Southeast have been orphaned by their supporting institutions, while at the same time many herbaria are flourishing. Although systematics has gone through a period where molecular data were considered qualitatively better than morphological data, we are beginning to see a return to a more balanced approach in the study of plant systematics and evolution. There is a growing awareness that the information contained in herbaria can be of great value in helping us restore plant communities, in documenting the vegetation of the past, and in evaluating changes in the vegetation of the future. In order to be certain that plant collections are protected, we must educate the public about their value. We must develop partnerships among herbaria at the state, regional and national levels to provide advice and support, as well as to make adequate plans to conserve abandoned collections. We must also use these partnerships to help utilize our collections to their fullest potential. Herbaria at field stations, four-year colleges, comprehensive universities, research universities and botanical gardens must work together to ensure that this national treasure is conserved.

281. FUNK, V. A. Department of Botany, Smithsonian Institution, Washington, D.C. 20560 – The Herbaria of the Southeast United States, an update.

Herbaria are critically important resources for botanical research and teaching as well as for reference and comparison for those doing plant-related research and biological resource management. It is a matter of national importance that we maintain and support these facilities, especially at a regional level. This survey was begun in late 1997 (published in 2000) and it covered the current status, activity level, and prognosis for future health of the herbaria in the southeastern region of the U.S. At that time 40 of the herbaria surveyed, one quarter of the

active ones that we surveyed, holding nearly 1,600,000 specimens, were either inactive or the person in charge fears that they would become so in the near future. Four years have passed since much of the data were collected and we can now assess the changes that have occurred in those 40 herbaria. Some have improved by gaining curators and beginning new programs, others have decreased in their activities. The need to develop state networks to actively work with administrators and politicians to encourage the support of herbaria still exists.

282. HORN, CHARLES N. Newberry College, Newberry, SC 29108—Herbaria at four-year colleges: the balance between teaching and curation.

The typical professor at a four-year college or university in the southeast has a number of duties that differ from that of individuals at research universities. Here, the emphasis is not on research, but on teaching. Curation of a herbarium is typically completed in a professor's spare time, such as on weekends or more commonly, during the summer. As a result many of the herbaria are small (less than 10,000 specimens), local or regional in scope and only include plant groups of a botanist's interest. These collections are developed and kept out of a love for field botany and to support the teaching of botany and ecology classes rather than a need to preserve voucher specimens for research projects or for extension identification purposes. In many cases money is also tight, with little or no money for herbarium assistants, cabinets or supplies. Despite these setbacks, these herbaria include important specimen resources for local floras and may include rare species of local concern.

283. JONES, RONALD L. Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475 – The herbarium at the comprehensive university-promoting the growth, maintenance, and support of these disappearing facilities.

Herbaria at comprehensive universities face many challenges in the 21st Century. Traditionally these herbaria have served generations of undergraduate and master's level students, faculty, researchers, and others in a many different ways. These collections, however, have become more and more susceptible to abandonment or transfer to other institutions, for a variety of reasons, and this loss is occurring at a time when there is a growing awareness of the significance of herbaria for biodiversity studies. This problem has been attacked on a variety of fronts at ECU, including the following: gaining support from the university to obtain the necessary space, funding, and release time; efficient utilization of student workers; publicizing the herbarium and its uses; development of a botany-option degree; establishment of relationships with the Kentucky State Nature Preserves Commission and the Kentucky Biodiversity Task Force; working with the Kentucky Native Plant Society to develop short courses in botanical studies; and the utilization of resource people both within and outside of the university in solving database problems. The ECU Herbarium, as a result of these efforts, has experienced substantial growth over the last decade, and now plays a prominent role not only in departmental and community programs, but also in the state efforts to document the biodiversity of Kentucky, and to produce a "Guide to the Vascular Flora of Kentucky."

284. HAYNES, ROBERT R., Department of Biological Sciences, The University of Alabama, Tuscaloosa, AL 35487 – Herbaria in research universities.

Research universities for the purpose of this presentation are defined as the major state-supported and private Ph. D. granting institutions in each state of the Southeastern United States. A questionnaire concerning support by the administration, new facilities, and possibility of curator being replaced following retirement, among other things, was sent to each herbarium at a research university in the southeast. Responses were received from over three-fourths of the curators, ranging from ones that are quite optimistic about their future to herbaria that have either been given away or for which the curator is concerned about that possibility. In general, curators are concerned about the movement of biology and botany faculty towards molecular

approaches. In fact, molecular systematists are replacing many curators, which only exacerbates these concerns. We as curators must accept that this trend will only accelerate and then attempt to educate our colleagues and administrators as to how herbaria are valuable to the molecular approach. Overall, financial support at the university level is usually limited to the operating budget and rarely includes any research funds. One positive among our herbaria is the number of herbaria (seven) that either have recently moved into new facilities or are moving into new facilities fairly soon. The administration at those institutions has made a fairly obvious statement about its support for the collection by allocating large sums of money for the new or remodeled building. In addition to local support, a few of the institutions have received federal funding for database projects or for equipment or supplies support associated with the new buildings. In summary, if we as curators want herbaria to continue to thrive at research institutions, we must educate our administrators about the value of the collection not only to our research but also to the research of many of the remaining faculty.

285. WHITE, PETER S. North Carolina Botanical Garden at the University of North Carolina at Chapel Hill, Chapel Hill, NC 27599 – Herbaria in botanical gardens.

Botanical gardens can be important centers of research in systematics, plant geography, ecology, conservation, and horticulture. Research on living plants is often a necessary compliment to and benefits from herbarium-based study. In two larger senses, botanical gardens are natural homes for herbaria. First, as public places they are ideal for the interpretation of the value of systematics and herbaria to society. Second, they are less prone to the changes in research direction that have and are occurring at many universities and which often results in inadequate space, funding, and curation for the collection. Herbaria potentially occupy large amounts of floor space and yet serve comparatively few professors and graduate students within a department. The collection is nonetheless critical to scholars, conservationists, and the public outside the university. Botanical gardens, with a general mission in public service and outreach, are living museums and readily can take on the role of holding museums of plant specimens as perpetual archives of information. Though the bulk of the collection acts as an archive most of the time, active research programs are essential to the growth, curation, and funding of such collections. Herbaria in botanical gardens therefore must have strong ties to nearby universities.

286. FISHER, KIMBERLY J. AND MARK W. HESTER. Dept. of Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 – A mesocosm investigation of floating marsh response to increased salinity and nutrient levels.

Wetlands in Louisiana are being negatively impacted by high rates of relative sea-level rise (global sea-level rise plus subsidence). Encroaching saline water poses a significant stress to the growth and survival of fresh marsh vegetation. River diversions in Louisiana have been proposed as a restoration method that would bring in fresh water, suspended sediment, and also an influx of nutrients to deteriorating wetlands. Though widely accepted as beneficial to attached marshes, the effects of river diversions on floating marshes are less clear. In this study we are examining the effects of salinity level and nutrient loading on *Panicum hemitomon* floating marsh. To assess these effects, we initiated a mesocosm study consisting of a factorial design with two salinity levels (0 and 2.5 ppt) and also low and moderate loadings of both phosphate and nitrate. Variables measured include photosynthetic measurements, soil redox potential, floatant buoyancy and stem count by species. Results to date indicate a negative salinity effect on photosynthesis and floatant buoyancy. Funding provided by the Louisiana Board of Reagents.

287. HOEPPNER, SUSANNE S., JONATHAN M. WILLIS, AND GARY P. SHAFFER. Dept. Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 – Preliminary Findings of the Feasibility Study of a Freshwater Diversion Into the Maurepas Swamp - Part I: Primary Productivity of Trees

The wetlands south of Lake Maurepas have previously been identified as degraded swamp forests in need of restoration. A freshwater diversion has been proposed to bring a greater load of nutrients, sediments and freshwater into the system. To evaluate the potential effects of the proposed diversion, measures of the primary production of trees and the herbaceous undercover, soil subsidence levels, and various soil characteristics were taken at twenty characteristic study sites within the Lake Maurepas basin. This presentation focuses on the primary productivity of trees in the cypress-tupelo swamp ecosystem. The measure of the primary production of trees was broken down into the two main components of litter fall and wood production. Soil characteristics examined included soil bulk density, interstitial salinity, soil moisture, pH, redox potential (Eh), soil nitrate and ammonia levels, soil sulfide concentrations, and ICAP elements. The most degraded sites chosen for this study exhibited significantly higher interstitial salinities and were found to have significantly lower rates of tree growth and litterfall production, as well as significantly lower basal wood areas per study plot than all other sites. The most productive sites of this study were interior swamps and those affected by the Amite River Diversion Canal.

288. SCHAFF, STEVEN D.<sup>1,2</sup>, S. REZA PEZESHKI<sup>2</sup>, AND F. DOUGLAS SHIELDS, JR.<sup>3</sup>. <sup>1</sup>Institute of Ecology, University of Georgia, Athens, GA 30602, <sup>2</sup>Department of Biology, University of Memphis, Memphis, TN 38152, and <sup>3</sup>National Sedimentation Laboratory, USDA-ARS, MS 38655 – Streambank restoration using willow; a case study of site specific limitations to success.

Channel straightening, changes in land use, and construction of reservoirs have resulted in accelerated channel erosion in northern Mississippi, resulting in downstream habitat destruction, sedimentation, and degradation of water quality. Restoration efforts are underway to rebuild eroded streambanks providing bank stability using natural vegetation rather than traditional engineering techniques. However, success has been limited, primarily due to poor survival. A two-year field study was conducted at Twentymile Creek, in northern Mississippi, investigating edaphic factors limiting the survival of black willow (*Salix nigra*) cuttings used for streambank restoration. Growth, biomass production, and physiological function (e.g. net photosynthesis and leaf chlorophyll content) were all significantly reduced in willow cuttings subjected to greater soil moisture deficits. However, soil texture emerged as the dominant factor determining willow post growth, health and survival. Coarse-grained soil (sands), even when subjected to reductions in soil moisture, were more conducive to post growth than were fine-grained soils (silt/clay). Our results strongly suggest that soil conditions can determine restoration success by affecting plant physiological function. Therefore, it is critical that consideration of site conditions, for example soil texture, is factored into the selection of candidate species to be used at individual restoration sites.

289. WALSER, CHRIS A.<sup>1</sup> AND HENRY L. BART JR.<sup>2</sup>. <sup>1</sup>Department of Biology, Albertson College of Idaho, Caldwell, ID 83605 and <sup>2</sup>Tulane University Museum of Natural History, Belle Chasse, LA 70037 – Patterns of interspecific association between bluehead chub (*Nocomis leptocephalus*) and other cyprinids in four river drainages of the southeastern U.S.

Several members of the genus *Luxilus* and genus *Notropis* are nest-associates of bluehead chub (*Nocomis leptocephalus*). We examined the strength of association between the relative abundances of 40 cyprinid species and bluehead chub abundance in four river drainages-- (Altamaha River, Apalachicola River, Mobile Bay and Pearl River). Species' abundance data were determined from 498 historical collections housed at the Tulane University Museum of Natural History. In lowland drainages (Mobile Bay and Pearl River), relative abundances of 10 cyprinid species were significantly associated with bluehead chub abundance. In both lowland drainages, the relative abundances of the striped shiner (*Luxilus chrysocephalus*) were significantly positively correlated with bluehead chub abundance ( $p < 0.01$ ). In the Mobile Bay drainage a highly significant positive relationship was also observed between the rough shiner

(*Notropis baileyi*) and the bluehead chub ( $p < 0.01$ ). Significant associations between bluehead chub and other cyprinids were less common in upland drainages (Altamaha and Apalachicola River systems). Relative abundance of *Notropis lutipinnis* was significantly positively correlated with bluehead chub abundance in the Apalachicola River drainage ( $p < 0.01$ ). The finding that interspecific associations with bluehead chub occur more often in lowland than upland systems may be due to differences in species richness between these areas.

290. PHILLIPS, JERRI AND MARK SCHORR. Dept. of Biological and Environmental Sciences, University of Tennessee at Chattanooga, Chattanooga, TN 37403 – Effect of urbanization on the biotic integrity of fish assemblages in Black Creek, Chattanooga, Tennessee.

Black Creek is a third-order Ridge and Valley stream (Tennessee River drainage) in Chattanooga, Tennessee. Most of Black Creek's watershed is forested (ca. 71% in 1991); however, increasing urban development, particularly along riparian landscapes, could impact the stream's ecological health. We assessed fish assemblages (biotic integrity), water quality, instream habitat, and riparian land-use features at eight sites in Black Creek, May-June 2000. Water quality conditions (temperature, dissolved oxygen, pH, conductivity) were favorable for stream fishes, but some level of habitat degradation (bank erosion, sedimentation, loss of riparian vegetation) was observed at all sites. Electrofishing samples yielded a total of 29 species and 9,178 fish. Index of biotic integrity (IBI) scores ranged from 30 to 42, corresponding to IBI ratings of "poor" to "fair," respectively, at the individual sites. The IBI score was negatively correlated with sediment depth in the stream ( $r = -0.727$ ;  $P = 0.041$ ) and the percentage of urban land use in the riparian zone ( $r = -0.739$ ;  $P = 0.036$ ). Preliminary findings from this study document the negative effect of urban land use on biotic integrity in a Ridge and Valley stream, and provide baseline data for bioassessment and mitigation projects.

291. Shoup, Heidi R.<sup>1</sup>, Stuart Ludsins<sup>2</sup>, and Roy A. Stein<sup>2</sup>. <sup>1</sup>Dept. of Biological Sciences, University of New Orleans, New Orleans, LA 70148 and <sup>2</sup>Aquatic Ecology Laboratory, Ohio State University, Columbus, OH 43210 – A Quantitative Analysis of Zooplankton Sampling Methods.

A diverse array of zooplankton sampling techniques now exist, leading to difficulty in comparing zooplankton communities across studies. Given the paucity of information concerning gear-specific biases, we quantified how zooplankton net mesh size influenced abundance, size, and composition of zooplankton captured by sampling two Lake Erie sites monthly during summer 1996 with Wisconsin zooplankton nets (mouth diameter = 35 cm). At each site on each date, we collected zooplankton via vertical hauls (sampling depth = 200 cm) with four, different sized, un-metered nets ( $N=3$  replicates/site/mesh type). To quantify how mesh size influences filtration efficiency, we deployed nets with a mouth-mounted flowmeter in a diving well ( $N = 4$  replicates/mesh type), and compared 'true' water volume sampled (determined by the flowmeter) with theoretical water volume sampled. In general, un-metered 64- $\mu\text{m}$  mesh nets likely underestimated zooplankton abundance by ~40% because of their low filtration efficiency (~60%), whereas error associated with filtration efficiency was low for the three larger mesh sizes (nets were  $\geq 98\%$  efficient). Nevertheless, the 64- $\mu\text{m}$  mesh net appeared to have estimated zooplankton abundance and size accurately across a wide range of taxa and size classes. Conversely, the three largest mesh sizes were deficient in their ability to collect the smallest zooplankton but they appeared to have estimated abundance of medium- and large-sized zooplankton reasonably well. These results suggest, that future studies should employ 64- $\mu\text{m}$ .

292. NELSON, DIANE R. Dept. Biological Sciences, East Tennessee State University, Johnson City, TN 37614 – Marine invertebrates of the Solomon Islands and Papua New Guinea.

The epicenter of marine biological diversity is in the Indo-Pacific, yet many of the species there remain relatively unknown or even unidentified, and many more await discovery. On research trips to the Solomon Islands and Papua New Guinea with Dr. Eugenie Clark, marine invertebrates and fishes were photographed with a Nikonos V camera with dual MV strobes. During scuba dives to depths up to 100 feet (30m), a combination of a 35mm lens with either a Nikonos close-up kit or with one of three different sizes of extension tubes was used to photograph marine organisms. A survey of the invertebrates from a variety of tropical habitats, ranging from coral reefs to "muck" (sand and mud bottoms), will be presented to illustrate their colors, morphology, ecology, and diversity.

293. LLEWELLYN, JEFFREY B. Ecology Program, Brevard College, Brevard, NC 28712 – Early morning and early evening counts of bird species, Beaver Lake Bird Sanctuary, Asheville, NC.

The Beaver Lake Bird Sanctuary is an 8 acre preserve owned by the Elisha Mitchell Chapter of the National Audubon Society, and is located along the east edge of Beaver Lake in north Asheville, North Carolina. The species of birds in the sanctuary and on the east end of Beaver Lake were recorded by sight and sound in a 2-hour period after sunrise and in a second 2-hour period prior to sunset on the same day. Recordings were made on four days in a 10-day period in June 2000 and on four days in a second 10-day period in July 2000. The two periods were separated by 4.5 weeks. For all counts, 8 in am and 8 in pm, the mean number of species recorded was 29.9 in am and 22.3 (74.5%) in pm counts, while the mean number observed was 26.0 in am and 17.4 (66.8%) in pm counts; the mean number of species recorded in am but not in pm counts, and in pm but not in am counts, was 8.9 and 1.25, respectively, while the mean number of species observed in am but not in pm counts, and in pm but not in am counts, was 7.4 and 1.1, respectively; and the mean number of lake species recorded was 5.1 in am and 4.3 (82.9%) in pm counts, while the mean number of non-lake species recorded was 24.8 in am and 18.0 (72.7%) in pm counts.

294. BROWN, DAVID AND JENNIFER LONG. Ecology and Evolutionary Biology, Tulane University, New Orleans, LA 70118 and Dept. of Biological Sciences, Southeastern Louisiana University, Hammond, LA 70402 – The effect of experimental fruit removal on territory structure of wintering Hermit Thrushes.

In southeastern Louisiana, fruits that are ripe throughout the winter such as Yaupon (*Ilex vomitoria*) and Privet (*Ligustrum sp.*) provide the primary food resource for wintering Hermit Thrushes (*Catharus guttatus*). Numerous studies have demonstrated that territory size and food abundance are inversely related, including preliminary evidence of such a relationship for wintering Hermit Thrushes. We wanted to test the importance of fruit abundance in controlling territory structure, and hypothesized that Hermit Thrushes directly monitor fruit abundance and adjust territory size and movement patterns to meet their energetic demands. We tested this hypothesis by experimentally removing fruit bearing plants from five Hermit Thrush territories and removed a similar amount of non-fruit bearing plants from five control territories. Our experiment took place during the month of January 2000, when fruits are in peak abundance. All territories were located in a mid-aged (15 yrs) unthinned Loblolly pine (*Pinus taeda*) plantation. This habitat has a high density of Hermit Thrushes that maintain distinct territories with little overlap.

295. MURRAY, REBECCA L., TYLER P. STANTON, AND VERL R. EMRICK. Conservation Management Institute, Virginia Tech College of Natural Resources, Blacksburg, VA 24061 – First described vocal mimicry of Bachman's sparrow (*Aimophila aestivalis*) in the piedmont of southeast Virginia.

Bachman's sparrow (*Aimophila aestivalis*) was first observed at Fort Pickett-Maneuver Training Center (FPMTC), Virginia, in 1993. Between 1993 and 2000, the identified range of the



Bachman's sparrow at FPMTC was limited to the controlled access area (CAA). The CAA serves as a buffer zone for various live fire military training exercises. Because of military training, entry into the CAA was severely restricted, thus limiting the monitoring of individual Bachman's sparrows. During a point count study conducted in 2000, two individuals were identified outside of the CAA. Both individuals were observed and recorded mimicking the song patterns of the common yellowthroat (*Geothlypis trichas*) and the indigo bunting (*Passerina cyanea*). The song is considered the most distinguishing characteristic, of this visually non-descript bird. In the past, the Bachman's sparrow song has been compared to that of the field sparrow and the Eastern towhee. However, suggestions of vocal mimicry observed in Bachman's sparrow behavior do not exist in professional literature.

296. NOLFO, LAUREN E.<sup>1</sup> AND CRAIG S. HOOD<sup>2,3</sup>. <sup>1</sup>Dept. Ecology & Evolutionary Biology, Tulane University, New Orleans, LA 70118, <sup>2</sup>Dept. Biological Sciences, Loyola University, New Orleans, LA 70118, <sup>3</sup>Tulane Museum of Natural History, Belle Chasse, LA 70037 – A 5-year study of microhabitat use and roost preference in the eastern pipistrelle bat, *Pipistrellus subflavus* in Southeastern Louisiana.

A 5-year mark-recapture study of a local population of the eastern pipistrelle bat, *Pipistrellus subflavus* was carried-out at two permanent winter roost locations (railroad bridges) in Tangipahoa Parish, LA. Monthly samples of four years of banding and environmental data were recorded for a total of 248 microhabitat roosts in these two bridge structures, resulting in individual and roost site histories. Data were gathered on a total of 294 bats, with 156 individuals recaptured 2 or more times. One of the bridges (Fluker, LA) had nearly uniform environmental conditions among roost sites, whereas the other (Tangipahoa, LA) had large magnitudes of environmental variation among roost sites. There were no sexual differences in microhabitat preference among bats at the Fluker bridge. In contrast, strong sexual differences were observed in microhabitat use at the Tangipahoa bridge-- females preferring sites with a specific limited range of temperature/light/humidity, whereas males were dispersed across these environmental variables. Individuals show general, but not exclusive fidelity to specific roosts within a bridge structure.

297. BURKE, T.S., M.L. HERRELL, AND M.E. HIGHT. Marshall University, Department of Biological Sciences, Huntington, WV 25755 – Marshall University Mammal Collection.

Started in the late 1970's, the only mammal research museum in West Virginia, with over 7,000 species, is housed in the Marshall University Vertebrate Museum. This scientific collection represents the species diversity found in the three distinct physiographical provinces in West Virginia. Proper field techniques are taught to mammalogy students, who apply these skills in the collection of specimens. Standard measurements are taken and recorded for each specimen. Voucher specimens are prepared using several skin and skeletal preparation techniques. Specimens are sorted by standard methods and are cataloged in evolutionary order. Once cataloged, specimens are installed into the museum collection according to the proper taxa and are entered into electronic databases. These specimens are important because each one represents material evidence of a specific generation in the evolutionary history of a species that can never be duplicated nor replaced. Information retrieved from the museum collection can be used for research, teaching, public health, documentation of state fauna, and environmental studies.

298. HOGAN, G. RICHARD. Austin Peay State University, Clarksville, TN 37043 – Selenium-induced hemolysis in mice: An *in vitro* determination.

Altered erythrocyte membrane fragility is created by a number of factors which increase the probability of erythrocyte rupture or hemolysis. Selenium is such a factor which has been



shown to promote a progressive anemia in cattle grazing on soil containing high selenium content. Others published that rodents fed a ration containing high levels of selenium developed a chronic hemolytic anemia. This study further explored the hemolysis-inducing action of selenium following a single injection at three different concentrations and using the split-dose technique. Following administration of selenium, cardiac blood was withdrawn, incubated, and centrifuged. The incubation supernatant absorbencies and hemolysis percentages were then determined. The *in vitro* hemolytic indices of the three treatment groups were determined by comparing the percentages to those of the saline-injected controls. Data indicate a direct relationship between the treatment level of selenium and the degree of hemolysis and an inverse one for times between selenium injection and the blood collection for determination of the hemolytic indices.

299. COHEN, GLENN M.<sup>1</sup>, ERIC G. SPOKAS<sup>2</sup>, AND PI-SHIANG LAI<sup>2</sup>. <sup>1</sup>Department of Biological and Environmental Sciences, Troy State University, Troy, AL 36082 and <sup>2</sup>UMDNJ-School of Osteopathic Medicine, 2 Medical Center Drive, Stratford, NJ 08084 – Baseline cytological and Na<sup>+</sup>/K<sup>+</sup>-ATPase activity in the gills of *Fundulus heteroclitus*.

The objective of these experiments was to prepare baseline studies of the cytology and Na<sup>+</sup>/K<sup>+</sup>-ATPase activities of the gills of *Fundulus heteroclitus* ("mummichog"). Using routine light and scanning microscopy, we confirmed the same cell types, numbers, and spatial relations as others have previously described. The biochemical studies, however, required the development of a direct assay for analysis of Na<sup>+</sup>/K<sup>+</sup>-ATPase activity of small gill samples. Using Chen's ascorbic acid method, we assayed levels of inorganic phosphate (Pi) spectrophotometrically. We found that basal ATPase activity (Pi generated in the absence of added Na<sup>+</sup> or K<sup>+</sup>) of mummichog gills was 2 to 3.5-fold greater than Na<sup>+</sup>, K<sup>+</sup> stimulated activity. At 75 mM Na<sup>+</sup> and 15 mM K<sup>+</sup>, and the Na<sup>+</sup>/K<sup>+</sup>-ATPase activity of mummichog gill was maximal and completely inhibited by ouabain (1 mM). Mean specific activity of Na<sup>+</sup>/K<sup>+</sup>-ATPase of fresh water-adapted mummichogs was 53 ± 7 nanomoles Pi/min/mg protein. After exposure of freshwater-adapted mummichogs to 35 ppt seawater for 3 hr, gill Na<sup>+</sup>/K<sup>+</sup>-ATPase activity averaged 54 ± 5 nanomoles Pi/min/mg protein. In short, the "ascorbic acid method" was sensitive enough to measure Na<sup>+</sup>/K<sup>+</sup>-ATPase activity in the gills of small bioindicator fish without the need to pool tissues from different fish. (Supported by the Alabama Department of Public Health ALERT grant and by NIEHS AREA grant # 1R15ES09434-01A1).

300. OLANDER, JOSHUA AND MARK MEADE. Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 – Acute effects of sub-lethal exposure to nitrate, nitrite, and ammonia to juvenile *Palaemonetes* spp.

Grass shrimp, *Palaemonetes* spp., have often been used in studies dealing with toxicity and are considered a model indicator organism. Rarely has metabolism been studied in *Palaemonetes* in the presence of sub-lethal chemical concentrations. In this study, we examined the acute effects of sub-lethal exposure to nitrate, nitrite, and ammonia on aerobic metabolic rates in juvenile grass shrimp. Specimens (55-200mg wet wt.) were acutely exposed to 100 ppm nitrate, nitrite, or ammonia at a constant temperature of 22 C, and a salinity of 20 ppt. Animals were exposed for 10 min. and results tabulated. Aerobic metabolic rates were not significantly different among control animals and animals exposed to the toxicants. However, metabolism was reduced in animals exposed to nitrate or nitrite. Based upon previous studies, we suggest that the reduced metabolic rates observed were the result of decreased hemocyanin oxygen affinity.

301. FENTRESS, JENNIFER A. <sup>1</sup>, THEA HOEXUM BROUWER <sup>2</sup>, MARIUS BROUWER <sup>2</sup>, JOHN A. MCLACHLAN <sup>3</sup>, AND ANN O. CHEEK <sup>1</sup>. <sup>1</sup>Southeastern Louisiana University, Hammond, <sup>2</sup> University of Southern Mississippi, Ocean

Springs, and <sup>3</sup> Tulane University, New Orleans, LA – Examination of a potential environmental anti-estrogen.

Anthracene, a polycyclic aromatic hydrocarbon, has been shown to induce anti-estrogenic effects in fish. In the medaka, *Oryzias latipes*, short-term exposure to anthracene (ANT) blocks estrogen induced feminization, while long term exposure decreases fertility and hatching success. To determine if anthracene is an estrogen receptor antagonist, we measured vitellogenin (VTG) production in response to estradiol (E2) +/- anthracene. We exposed fry for 2 or 8 weeks post hatch either to a control, solvent, or E2 +/- anthracene treatment. Fish were sub-sampled at 2, 4, and 8 weeks post hatch for VTG analysis. Vitellogenin was analyzed using Western blots and quantified by densitometry. Fry exposed to estrogen for 2 weeks and sampled at 2 weeks produced VTG, while fish sampled at 4 and 8 weeks showed an attenuated response to estrogen. Fish exposed to estrogen for 8 weeks produced VTG throughout the exposure period. When exposed to ANT alone fish did produce VTG. Regardless of dose or exposure duration, ANT did not prevent the production of vitellogenin in co-exposed fish. Because anthracene was unable to block the production of vitellogenin, it is unlikely that its anti-estrogenic effects are mediated through the E2 receptor.

302. LORENZ, OTTO T.<sup>1</sup>, STEVE MILLER<sup>2</sup>, AND ANN CHEEK<sup>1</sup>. <sup>1</sup>Southeastern Louisiana University, Hammond, LA 70401 and Aquarium of the Americas, New Orleans, LA 70130 – Reproductive physiology and endocrinology of the banded watersnake (*Nerodia fasciata*)

Little is known about the reproductive physiology of snakes. Even less is known about the hormone cycles of snakes experiencing normal light and temperature conditions. To address the need for integrative and natural observations of these phenomena, a year-long study was designed to study male and female banded watersnakes (*Nerodia fasciata*). Estrogen, testosterone, and vitellogenin (yolking protein) were measured monthly. Ultrasounds were used to examine follicles and embryos and cloacal washes for sperm were performed to indicate sperm production in males or recent mating in females. Correlations were examined between testosterone and male production of sperm, spring mating and male and female hormone profiles, and an increase in follicle growth, vitellogenin, and estrogen in the spring. With no extended inactive season there are some interesting differences between this species and more temperate. This has potentially valuable implications for the historical ecology of reproduction in colubrid snakes.

303. WILSON, MISTI H. AND MARK E. MEADE. Dept. of Biology, Jacksonville State University, Jacksonville AL 36265 – Effects of sub-lethal exposure to combinations of ammonia, nitrite, and nitrate on aerobic metabolism in juvenile Australian crayfish, *Cherax quadricarinatus*.

Ammonia, nitrite, and nitrate are among the common water-born toxicants found in both natural and cultured populations of aquatic organisms. The metabolic effects of sub-lethal concentrations of ammonia, nitrite, and nitrate have been determined for juveniles of the Australian freshwater parastacid species, *Cherax quadricarinatus*. Little information exists, however, regarding the combined effects of these toxicants on metabolism in this species. In this study, we examined the combined effects of acute exposure of these toxicants on resting metabolic rates. Juveniles chosen for this study ranged from 10-100 mg wet weight. All measurements were conducted at 28 C in freshwater. Aerobic metabolic rates were determined using the YSI model 5300 Biological Oxygen monitor following standard protocols. Sub-lethal concentrations of toxicants used were chosen based upon previous toxicity studies. Currently, metabolic rate data are being compared among control animals and animals exposed to ammonia/nitrite or ammonia/nitrate combinations.

304. GUTHRIE, JOSEPH AND MARK MEADE. Dept. of Biology, Jacksonville State University, Jacksonville, AL 36265 – Effects of sub-lethal exposure to ammonia, nitrite, and nitrate on metabolic rates in juvenile *Oreochromis niloticus*.

Freshwater tilapia, *Oreochromis niloticus*, have been introduced to many temperate and tropical regions of the world. In many regions, tilapia are often used in toxicity studies as a model indicator species. The lethal concentrations of natural born toxicants, such as ammonia, nitrite, and nitrate, have well been established for this species. However, the effects of sub-lethal exposure of these toxicants on metabolic rates have not been examined. In this study, we examined the effects of acute exposure of ammonia, nitrite, and nitrate on resting metabolic rates in juvenile tilapia. Juveniles chosen for this study ranged from 10-100 mg wet weight. All measurements were conducted at 28 C in freshwater under normoxic conditions. Aerobic metabolic rates were determined using the YSI model 5300 Biological Oxygen monitor following standard protocols. Sub-lethal concentrations of toxicants used were chosen based upon previous toxicity studies. Currently, metabolic rate data are being compared among control animals and animals exposed to the various toxicants.

305. LALLI, PETER N., SYED S. MAHMOOD, AND JAY A. YODER. Department of Biology, Wittenberg University, Springfield, OH 45501 – Determination of aggregation cues and arthropod source for the Madagascar-hissing cockroach mite, *Gromphadorholaelaps schaeferi*.

Madagascar hissing-cockroach mites form tight aggregations predominantly at the leg bases and thoracic spiracles of their cockroach host. These clustering locales are remote from cockroach grooming and are highly specific for feeding (mites feed on cockroach saliva), water vapor absorption and accessibility to mates. In bioassays, mites exposed to killed mites, crushed mites, mite-exposed filter paper discs, and cuticular lipid extracts displayed no significant attraction or repelling behavior characteristic of aggregation, alarm (=defense secretion), or sex pheromone production. In contrast, host cockroaches and their cuticular extracts, new cuticle, in particular, were highly attractive to mites. The most profound behavioral modification occurs during the cockroach molt when mites are attracted and migrate to new cuticle exposed on the dorsum, which allows mites to remain with the host rather than being shed. Because of the ideal environment provided by the cockroach (ample food and water and free of predators), the mite's typical pheromones are inactive and behaviors are modified by cues from the cockroach. In turn, the cockroach benefits from the mites by the extermination of potentially harmful ectoparasitic invaders.

306. MAHMOOD, SYED S. AND JAY A. YODER. Department of Biology, Wittenberg University, Springfield, OH 45501 – Desiccation-hardiness properties of glycerol and its relation to freeze tolerance in the flesh fly, *Sarcophaga bullata*.

The role of glycerol as a cryoprotectant derives from elevated body levels associated with rapid cold hardening. In flesh fly pupae, *Sarcophaga bullata*, protection from extensive tissue injury and death at  $-10^{\circ}\text{C}$  can be generated by exposing the fly briefly to  $0^{\circ}\text{C}$ , which elevates glycerol levels. Our study demonstrates that in addition to protection, fly pupae injected with glycerol [range from 0.1-10%] also retain water more effectively (they had lower water loss rates) than saline-injected and untreated controls. Results were similar for pupae that had been injected as third (final) instar larvae. A typical physiological dose-response relationship, where increased concentration results in a greater response, was not apparent. By comparison, injections with trehalose, a predominantly occurring disaccharide and known cryoprotectant (but not in *Sarcophaga*), did not yield reduced water loss rates. Thus, in flesh flies, glycerol protects dually against freezing and water loss and considerably enhances the capacity to survive cold temperature.

307. YODER, JAY A., KATHLEEN A. REINSEL, AND JAMES M. WELCH. Department of Biology, Wittenberg University, Springfield, OH 45501 – Herding behavior promotes water conservation in the sand fiddler crab, *Uca pugilator*.

Over 10 million sand fiddler crabs, *Uca pugilator*, inhabit a 0.2 km<sup>2</sup> sandflat on the Rachel Carson Estuarine Research Reserve near Beaufort, North Carolina. Crabs are active at low tide, feeding on surface sediments in large groups, known as herds, that regularly exceed densities of 200/m<sup>2</sup>. Access to mates and defense are well-known benefits of herding. This is the first report that herding also facilitates water conservation. Crabs in groups of 10 and 20 retained water twice as effectively as isolated individuals; the effect was not as pronounced for a group size of five. This crab also features a 30-35°C threshold with high activation energies ( $E_a$ 's) for a particularly rapid water loss, fast transpiration rates, a moderate tolerance for dehydration and an inability to absorb water vapor from the air (= they are 'leaky') – plus they reside in a warm, salt-rich environment. Thus, herding may be an adaptive behavior to help reduce otherwise large doses of body water. This has implications for terrestrialization and the possible existence of a social structure, because this crab is semi-terrestrial and because 'group effects' are generally associated with eusocial arthropods.

308. MORTON, DAVID, JAMES. H. HOWARD, JONATHON D. WINTER, AND KURT M. MUEHLEISEN. Frostburg State University, Frostburg, MD 21532 – Histopathological screen of serially sectioned amphibian larvae after chronic exposure to chlorpyrifos, carbaryl and imidacloprid.

Surviving larvae of *Bufo americanus* and *Pseudacris triseriata* exiting trials after exposure to the three toxins were fixed in Bouin's solution and processed. Larvae were from control, low (LC<sub>50</sub>/100), and medium exposure (LC<sub>50</sub>/10) tanks. Organs screened were the eye, skin, lung, small intestine, liver, and spleen. After identification of possible histological markers showing significant variation, slides bearing sections from each individual from one combination of species/toxin were examined with an array of compound light microscopes. For each histological marker, individuals were arranged in order of increased expression and assigned a number (1 to 4). Screening was done blind as to treatment level. Thirteen markers were identified and examined. Statistical analysis suggested several relationships: 1) the thickness of stratum germinativum of the epidermis increased to a greater extent after exposure to imidacloprid compared to both of the other toxins; 2) the thickness of the muscularis externa of the small intestine increased to a greater extent after exposure to imidacloprid compared to chlorpyrifos; and 3) low and medium levels of exposure to carbaryl increased the thickness of the muscularis externa of the small intestine compared to controls. We wish to thank the National Fish and Wildlife Foundation for funding this pilot study.

309. STEELE, EDNA<sup>1</sup> AND NIKKI MAPLES<sup>2</sup>. <sup>1</sup>Department of Biology, Converse College, Spartanburg, South Carolina 29302 and <sup>2</sup>Clemson University Institute of Environmental Toxicology, Pendleton, SC 29670 – Occurrence of a dilepidid metacestode in the body cavity of the mummichog (*Fundulus heteroclitus*).

Dilepidid metacestodes were found in the body cavity of *Fundulus heteroclitus* during the summer of 2000. The prevalence of infection was 73.6% (mean intensity = 8; n = 205) in fish hosts collected from the unpolluted North Inlet Estuary at Georgetown, South Carolina and only 22.5% (mean intensity = 1; n = 40) in hosts collected from a polluted creek in Charleston, South Carolina. To date, only 2 dilepidid metacestodes have been recorded from this host: *Glossocercus cyprinodontis* recorded from Galveston Bay, Texas and *Cyclustera* sp. recorded from eastern United States (possibly Georgia or North Carolina). The metacestodes collected in this study appear to resemble that of *Glossocercus*. However, until the adult worms are found and described, it is not possible to determine the genus it belongs to. This is the first report of the occurrence of dilepidid metacestodes in *F. heteroclitus* in South Carolina. A description of the parasite including light micrographs and scanning electron micrographs is included. This study was supported by Converse College (Summer Research Fund).

310. RAMSDELL, CLIFTON AND KELLY PRINCE. University of South Carolina, Columbia, SC 29208 – Comparative Genome Mapping of *Peromyscus maniculatus*

*Peromyscus* chromosome 13 shows homology to mouse 11, rat 10, and human 17. This had been previously established by fluorescent in-situ hybridization (FISH) analysis using probes for the genes Tk1 (thymidine kinase 1) and Tp53 (tumor suppressor protein 53). Linkage analysis was done by determining and examining interspecies PCR fragment length polymorphisms between *P. maniculatus* and *P. polionotus* of genes that are located on mouse chromosome 11. The PCR fragments were generated using CATS (comparative anchor tagged sequence) and microsatellite primers for the specific genes or of interest. The F1 hybrids were then backcrossed to *P. maniculatus* and their progeny were analyzed for presence of the alleles. Linkage was then computed based on recombination frequency. Resulting homology may help show that a cluster of genes, including many major structural protein genes, has been well conserved throughout several mammalian species.

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## REVIEWS

James Ross, *Review Editor*  
7196 College Station Dr., Cumberland College  
Williamsburg, KY 40769-1382

Reynolds, J.E., R. S. Wells, and S. D. Eide. 2000. **The Bottlenose Dolphin**. University Press of Florida, Gainesville, FL. 304 pages. \$34.95.

The book "The Bottlenose Dolphin: Biology and Conservation", by J.E. Reynolds III, R. S. Wells, and S.D. Eide, provides an excellent review of what is presently known about the biology of the bottlenose dolphin. It is suitable for both lay people and as an introduction to marine mammal professionals and students. It pinpoints the major questions that researchers have been attempting to answer and at the same time gives us an account of why our knowledge is still limited and why it is so challenging to study these creatures. It also leads the reader through new techniques applied to the study of dolphins, which allow scientists to find out more in less invasive ways. Throughout the book, examples are drawn from studies carried out around the world, showing, in many cases, the plasticity of the bottlenose dolphin to adapt to different environments.

In general, the topics are analyzed in a summarized fashion and yet go into enough detail to give the reader a good understanding of the key-factors underlining such a complex organism. Straightforward explanations of terms are provided either in the text or in the glossary.

The titles of the chapters provide a fairly good anticipation of their content. However, some topics, such as sensory systems and threats, are dealt with in several chapters. Thus, readers are often referred to previous or later chapters. This and the fact that the table of contents does not list all the sections within chapters, limits the use of this book for a quick reference on a particular topic. As would be expected in a book about a protected species, threats that bottlenose dolphins face as a result of human activities are highlighted. The book provides the sense that multiple threats, such as pollution, noise, and general habitat degradation and loss, could in combination be disastrous for some bottlenose dolphin populations. Yet, there are also messages of hope if humans act expediently to reverse environmental damage.

The authors refer the reader back to the ancestors of bottlenose dolphins, to extinct cetacean groups, leading us step by step through the adventure of finding links between species. The main phylogenetic theories are presented and discussed.

The book dives into the myths surrounding dolphins and current public perception, showing how much is fantasy and how much is reality. It confronts the reader with the question: "Are dolphins basically similar to humans or fundamentally different from us?" in terms of their anatomical, physiological and behavioral features. It highlights the features required for adaptation to a marine environment. For example, why is large size good?; why is blubber better than thick dry fur? How is simultaneous ingestion and breathing possible? With help of these questions, it introduces the reader to an array of techniques to study dolphins.

The book vividly describes functions of anatomic structures, how dolphins use their sensory systems, the characteristics of dolphin societies, and the mechanisms for reproduction and feeding. By attempting to let us see dolphins as the authors see them, the authors provide a more realistic view than the one we built in the past several decades, largely based on popular literature and movies.

Two aspects, "energetics" and "echolocation", are addressed rather superficially considering the extensive work carried out in these fields in the past several years. Nevertheless, good references for further reading on these topics are provided. On the other hand, a very good account is given of "vision", and contrasting it with human vision was particularly successful. Cognition is one of the strongest chapters, exploring questions such as "what makes us view bottlenose dolphins as intelligent?"; "how can intelligence be measured and what factors promote a big brain?"; "how advanced is research in understanding if dolphins are indeed intelligent, and able to use language?"

Several types of interactions with humans are reviewed. Only one out of ten interactions is referred as positive. Controversial interactions include the use of dolphins for rehabilitation programs for disabled children, the military, and public display. The captivity issue is also dealt with in the chapter "A crisis at the Turn of the Twenty-First Century?" which emphasizes the difficulties associated with releasing captive dolphins into the wild. It illustrates this issue with several release attempts, mostly unsuccessful. However, it argues that few attempts have been made with proper preparation and training of the dolphins before release. The authors have a generally pro-captivity stand on marine mammals, and this acknowledged bias does not address valid questions surrounding increasing numbers of dolphins born into captivity, and the long-term fates of formerly sick dolphins rehabilitated in captivity. The "captivity" issue is complex, and it is this reviewer's opinion that both sides of the argument have not been treated quite evenly. It is left to the reader to explore complementary issues to maintaining dolphins in captivity, such as ethical questions, which are beyond the scope of this book.

This book enables the reader to thoroughly embrace conservation issues. It highlights major threats such as indirect takes by fisheries, the emergence of important U.S.-based legislative measures such as the Marine Mammal Protection Act, limitations in dealing with current threats such as boat collisions, and the role of enforcement agencies as well as all users of marine resources. Two phenomena, global warming and El Niño, which may have serious effects

on marine mammals, deserved to be addressed in this book. Considering that the nature of the book does not allow dealing with topics in depth, it would be useful to provide at the end of each chapter a selection of recommended literature for further reading. References to the literature are at the end of the book, not after each chapter. The sources of many statements are well documented by an extensive description of footnotes, as well as by the references.

The book has a considerable number of pictures, consisting of photos (mostly black and white), diagrams and drawings. The photos and diagrams are helpful in visualizing aspects discussed in the text, and also in appreciating the elegance of bottlenose dolphins. The drawings tend not to add extra value to the book.

Probably due to the need to address at times complex questions in a concise manner, the authors often simplified, such as referring to "dolphins" in general, even when a particular topic does not necessarily apply to all species that fall under this term. However, such simplification is in almost all cases valid; and at any rate, the reader should know that the subject is the bottlenose dolphin throughout.

This is a book about the past, the present and the future of bottlenose dolphins, and how a better understanding of their world may enhance their chances of surviving. It is important reading for especially lay people interested in the progress of bottlenose dolphin research and concerned about their conservation. In short, this book gives us a better understanding of what makes a bottlenose dolphin a unique marine creature with so much still to be learned.

PAULA MORENO, *Mammal Research Program, Texas A & M University, Galveston, TX 77551.*

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## **NEWS OF BIOLOGY IN THE SOUTHEAST**

Jon R. Fortman – *News Editor*  
Division of Science and Math  
Mississippi University for Women  
Columbus, MS 39701

## **ABOUT PEOPLE AND PLACES**

### **Kentucky**

Morehead State University, Department of Biological and Environmental Sciences. Dr. Allen Risk was awarded the fifth annual Biological Diversity Protection Award by the Kentucky State Nature Preserves Commission. This award recognizes those who have demonstrated dedication and success in protecting Kentucky's biological diversity. Dr. Risk has discovered many species of mosses new to the state as well as several flowering plants. He is dedicated to increasing the knowledge about the distribution and status of the poorly known group of plants, the mosses. The commission protects natural areas in a preserve that now covers more than 14,000 acres statewide. Dr. David Magrane has taken over the chair's position in the Department. He has served Morehead



State University for 24 years as Professor of Biology. He replaced Dr. Joe Winstead who accepted a position as Dean of the College of Science and Technology at Southern Arkansas University.

### Mississippi

Dr. Andrew Douglas, Director, and Dr. Lucile McCook, Curator, recently received a \$300,000 grant from NSF to fund the refurbishment of the University of Mississippi Pullen Herbarium. The grant will also provide technical support for herbarium operations. Dr. Gail Stratton received several photo awards from the Michigan Entomological Society. She received first place overall and first place life history for her photo of a female green lynx spider (family Oxyopidae) and female *Monobia Quadridens* (Linnaeus) (family Eumenidae). First place in the portrait category was also awarded to her photo of a stinging rose caterpillar (family Limacodidae).

### Tennessee

Drs. Massimo Pigliucci and Mitch Cruzan have received an NSF grant to study the simultaneous response of *Arabidopsis* to photoperiod and shade in Europe. The research involves a combination of field work, experimental studies, and molecular markers. The project is funded for \$330,000 over a period of three years.

Dr. Pigliucci's lab has been featured in an article on using *Arabidopsis* for evolutionary ecology research. The article, authored by Elizabeth Pennisi, is entitled "Stalking the Wild Mustard" and appears in *Science* 290 (5499): 2055.

## MUSEUMS AND BOTANICAL GARDENS

### Alabama

Anniston Museum of Natural History. On February 20, the Museum kicked off its annual Garden and Home Lecture Series with an inspiring presentation about the wildflowers of Alabama by botanist, author and photographer Caroline Dean. At 82, Dean continues to maintain the impressive garden that she and her late husband created, and helps educate people from around the world by answering botanical questions sent to her through her website. She was the 1993 recipient of the J. Kelly Mosley Award for conservation and propagation of native plants and wildflowers. She is a member of the Georgia Botanical Society and the American Association of Field Botanists. May 3 will be the final lecture by David Heller, Vice President of Marketing for Replacements, Ltd. of Greensboro, North Carolina.

### Georgia

Michael C. Carlos Museum, Emory University. On February 11, a program was presented on the importance of plants in Egyptian magic and medicine. The lotus endured for centuries as the Egyptians' favorite flower both for its beauty and its wonder-working powers.



## Environmental Stewardship



### Top Environmental News

TVA held a dedication ceremony for the Buffalo Mountain Wind Park on October 13 and began the first commercial wind-power production in the Southeast. These wind turbines stand 290 feet from the top of an upright rotor to the ground. Get all the facts here.

### Annual Environmental Report

TVA's first Annual Environmental Report outlines the corporation's environmental accomplishments and challenges. View report in PDF format on web site.

### Green Power Switch

TVA and 12 public power distributors have launched a test of environmentally friendly power generation. Find out about how green power is generated for the program and how you can participate.

### Fast Facts:

TVA has spent more than \$2.6 billion on emissions controls at its 11 fossil-fuel plants.

TVA has bettered conditions for aquatic life in more than 300 miles of streams below TVA dams.

Since the late 1970s, TVA has reduced sulfur dioxide emissions at its fossil-fuel plants by about 65 percent.

Since 1995, TVA has reduced emissions of nitrogen oxides by 40 percent. By 2004 these emissions will have been reduced by 75 percent during the "ozone season" from May to September.

In 1999, TVA received a patent for a wastewater treatment system that uses constructed wetlands technology and is about 50 percent less expensive to operate and maintain than conventional treatment systems.

Environmental Policy and Principles. TVA's environmental policy and supporting principles define our commitment to stewardship of the Valley's natural resources.

<http://www.tva.gov/environment/index.htm>

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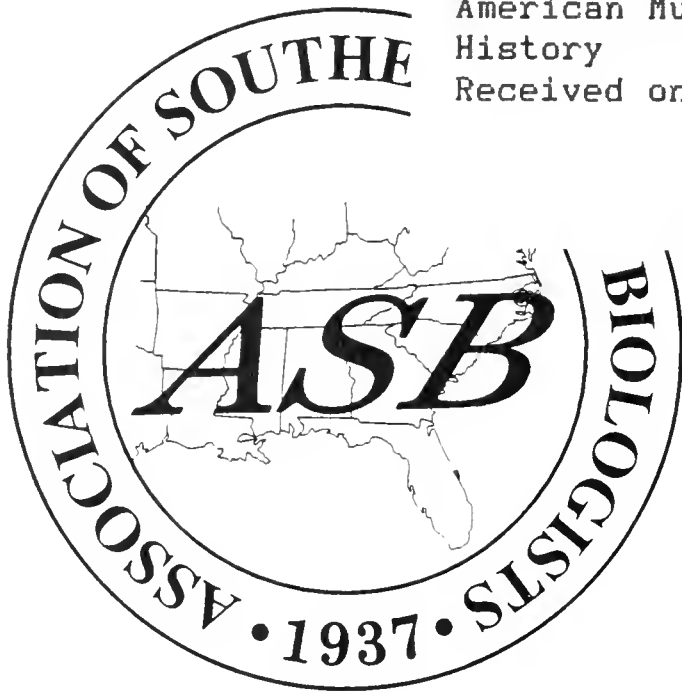
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